The FOUNDRY

Contents

VOLUME 67

NUMBER 12

DECEMBER, 1939

	PAGE
Editorial	21
Producing Malleable Castings in a Modern Foundry	22
Castability of Alloy Steel Castings *By R. J. Wilcox*	28
Methods of Testing Bonding Clay *By N. J. Dunbeck*	30
Avoiding Defects in the Nonferrous Foundry *By N. K. B. Patch*	31
A.F.A. Plans Chicago Convention and Exhibition	33
English Firm Casts Bells for 369 Years *By J. S. Trevor*	34
Questions and Answers	36
Men of Industry	40
Among Detroit Foundries *By A. H. Allen*	44
The Adventures of Bill *By Pat Dwyer*	50
Baltimore-Washington Foundrymen Hold Regional Conference	54
Foundry Exhibit Opened at Chicago Regional Conference	67
Activities of Foundry Groups	72
Foundrymen Stage One Day Meeting at Moline	83
Abstracts From World Literature	86
Obituary	88
Foundry Developments at Short Range	91
New Equipment and Supplies	92
Foundry Activities	114

Editorial Staff

FRANK G. STEINEBACH
Editor

PAT DWYER
Engineering Editor

EDWIN BREMER
Metallurgical Editor

DON S. CADOT
Art Editor

New York . . . B. K. PRICE, L. E. BROWNE, I. H. SUCH

Chicago . . . J. F. POWELL
Detroit . . . A. H. ALLEN
Pittsburgh . . . R. L. HARTFORD
Washington . . . L. M. LAMM
London . . VINCENT DELPORT

Advisory Staff

JOHN W. BOLTON
ALBERT E. GROVER
JOHN HOWE HALL
N. K. B. PATCH
HARRY A. SCHWARTZ

Business Staff

J. M. LATHROP
Advertising Manager

G. A. POPE
Assistant Advertising Manager

R. C. WELLMAN
Circulation Manager

New York . . . J. F. AHRENS
Chicago . . . L. C. PELOTT
Pittsburgh . . . S. H. JASPER
Cleveland . . A. L. KLINGEMAN

MAIN OFFICE

Penton Building, Cleveland, Ohio

BRANCH OFFICES

New York . 110 East 42nd Street
Chicago . 520 North Michigan Avenue
Pittsburgh . . Koppers Building
Washington . National Press Building
Detroit . . . 6560 Cass Avenue
London . . . . . Caxton House, Westminster, S.W.1.

THE FOUNDRY is published monthly by The Penton Publishing Co., Penton Building, 1213 West Third street, Cleveland, Ohio. JOHN A. PENTON, Chairman, Board of Directors; E. L. SHANER, President and Treasurer; J. R. DAWLEY and G. O. HAYS, Vice-Presidents; F. G. STEINEBACH, Secretary.

Subscription: United States, Canada and Mexico, $2.00 a year, Great Britain and other Foreign Countries, $4.00 a year; single copies, 25 cents. Copies published three months or more previous to date of current issue, 50 cents each. Entered as second class matter at postoffice at Cleveland under the act of March 3, 1879.

Copyright 1939, by The Penton Publishing Co.

Member: Audit Bureau of Circulations, Associated Business Papers, National Publishers Association.

"the longer we use it ... the better we

says A. L. Gartrell,

Purchasing Agent

THE PITCAIRN COMPANY

PITTSBURGH VALVE & FITTINGS DIVISION

Barberton, Ohio

25 YEAR USER

LINOIL

The Logical Oil for Uninterrupted Production

"Besides our regular daily production we have to be ready for back calls and that means keeping 1400 varieties of cores in stock. No matter how old a Linoil core is it is always as good as new,"

says Foreman King

THE WERNER G.

(DIVISION OF ARCHER -

2191 WEST 110th ST. ***Warehouse***

Boston, Mass.	Philadelphia, Pa.	Columbus, Ohio	Chicago, Ill.
Hartford, Conn.	Birmingham, Ala.	Dayton, Ohio	Moline, Ill.
Edgewater, N. J.	Buffalo, N. Y.	Indianapolis, Ind.	

"What we must have is uniformity and that's what we get in Linoil"

H. D. LILLEY
Foreman Grey Iron Corerooom

MILLIONS of castings made here with Linoil cores. Tiny ⅛-inch valves and fittings up to the giants for large city utilities systems; valves and fittings of every conceivable design and shape and purpose; valves and fittings of bronze, of copper-nickel, of grey iron, and of malleable iron. No time here to go back and do it over again if the cores go wrong. But they take no chances on their cores—they use Linoil always. Pittsburgh Valve and Fittings first tried Linoil 25 years ago and found it economical and dependable. They have used it from then until now for the same reasons. You, too, may profit by Linoil. For profits' sake investigate.

SMITH COMPANY

DANIELS - MIDLAND COMPANY)

Stocks

CLEVELAND, OHIO

Milwaukee, Wis.
Minneapolis, Minn.
St. Louis, Mo.
Kansas City, Mo.
Houston, Tex.
Seattle, Wash.
Spokane, Wash.
Portland, Ore.
San Francisco, Calif.
Los Angeles, Calif.
Salt Lake City, Utah

ROTOBLA

HAS EXACT ABRASIVE STREAM CONTROL--DOWNWARDS-UPWARDS-SIDEWAYS

"The Pangborn ROTOBLAST feeds abrasive to vanes without crushing—with less power—and at reduced maintenance, because, when necessary, its inexpensive wear parts can be so quickly replaced that labor time is reduced."

That's why all Pangborn ROTOBLAST Barrels, Tables and Special Cabinets are producing cleaning room economies of major importance. That's why the outlook for 1940 looms bright and prosperous for the ever increasing number of plants who have learned by actual experience that ROTOBLAST "Cleans Fast!" For Experience and Service — COME TO PANGBORN.

Bulletins available for all cleaning equipment needs.

PANGBORN CORPORATION

World's Largest Manufacturer of Blast Cleaning and Dust Control Equipment

HAGERSTOWN . . . MARYLAND

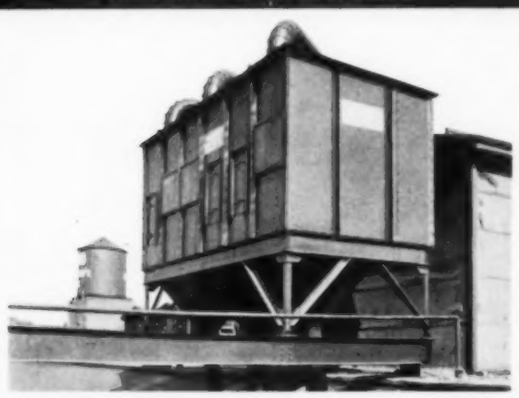
PANG

LASTING

TOMORROW'S CLEANING EFFICIENCY
IN TODAY'S BARRELS, TABLES, CABINETS

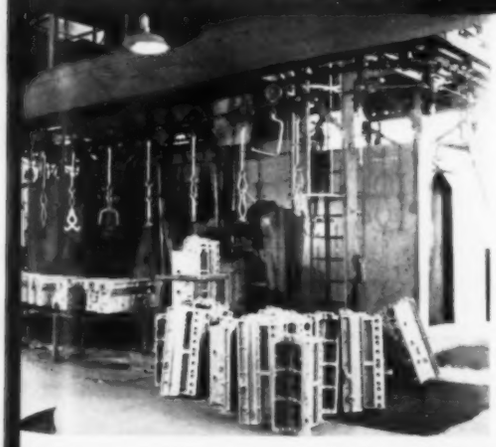
BARREL

DUST COLLECTOR

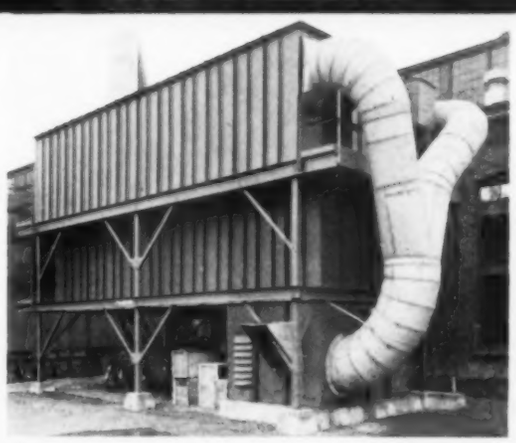


TABLE

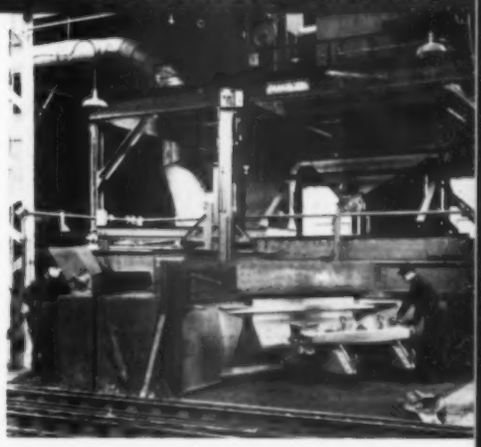
SPECIAL CABINET



DUST COLLECTOR



SIDE FRAME CABINET



BORN

AO

Safety Leggings

FOR ALL REQUIREMENTS

Safety leggings and spats for protection against heat, sparks, flame, and hot metal are now available as part of the complete line of American Optical safety clothing. Made in a variety of styles and a full range of sizes, these leggings are supplied in chrome tanned leather, fire-resisting duck, or "Sturdy-Weave" asbestos. They are easy to put on or take off, snug-fitting, comfortable to wear.

These leggings are promptly obtainable through 255 American Optical branches. For your requirements, a letter or phone call will put your American Optical industrial representative, located near you, *at your service.*

American Optical Company

SOUTHBRIDGE, MASSACHUSETTS

MANUFACTURERS, FOR MORE THAN 100 YEARS, OF PRODUCTS TO AID AND PROTECT VISION

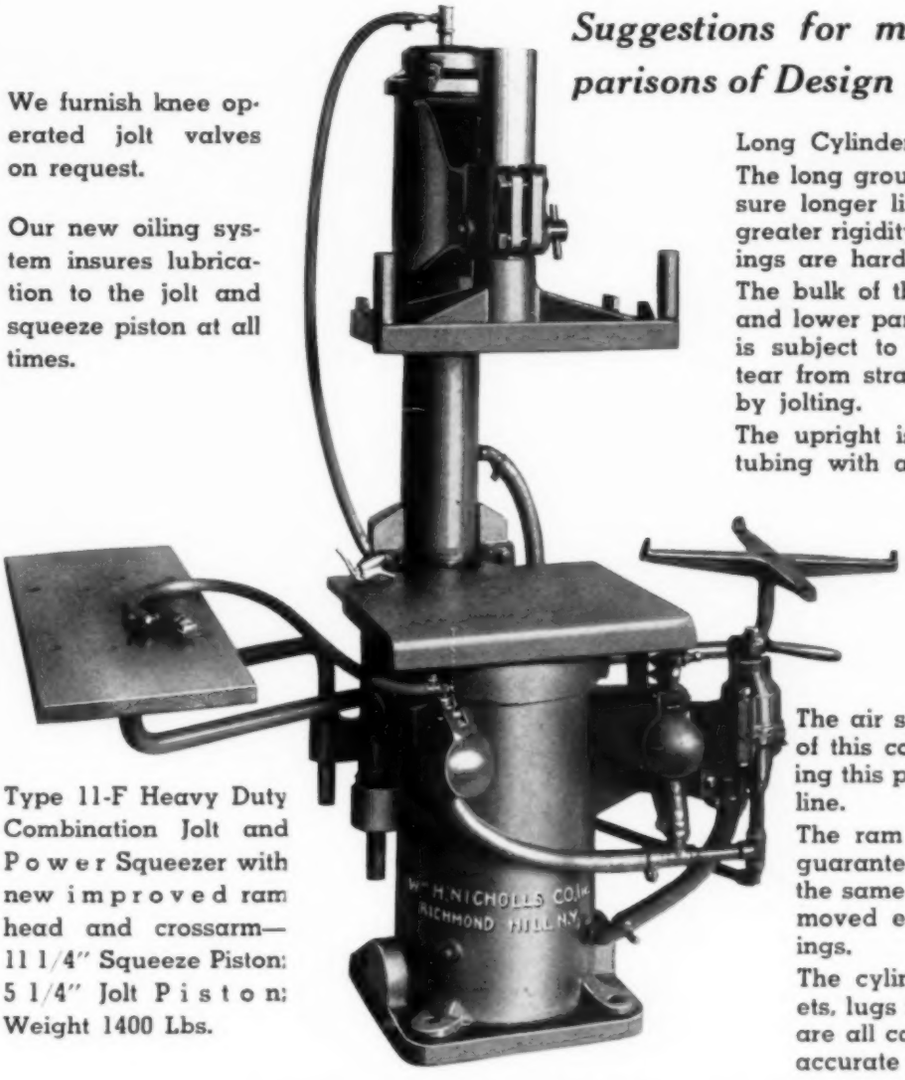
MOLDING MACHINES

for Fast, Dependable Work

ORIGINAL IN DESIGN
STURDIEST IN CONSTRUCTION
SIMPLEST IN OPERATION

We furnish knee operated jolt valves on request.

Our new oiling system insures lubrication to the jolt and squeeze piston at all times.



Type 11-F Heavy Duty Combination Jolt and Power Squeezer with new improved ram head and crossarm—11 1/4" Squeeze Piston; 5 1/4" Jolt Piston; Weight 1400 Lbs.

Suggestions for making your comparisons of Design and Construction

Long Cylinders and Pistons.

The long ground pistons and parts assure longer life, better alignment and greater rigidity. Guide pins and bushings are hardened and ground.

The bulk of the weight is in the base and lower parts of the machine which is subject to the greatest wear and tear from strain and vibration caused by jolting.

The upright is a double extra heavy tubing with a large margin of safety to withstand at least fifty (50%) percent more strain than it is subjected to. It also serves as an air reservoir at the machine and a water and oil trap.

The air supply is piped in on top of this column therefore eliminating this piping or hose at the floor line.

The ram head is made of steel, guaranteed against breakage, at the same time, light enough to be moved easily, due to ball bearings.

The cylinder, base, valve brackets, lugs for riddle and mold shelf are all cast in one piece, insuring accurate alignment and long life.

Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL, LONG ISLAND, NEW YORK

Foreign Manufacturers and Selling Agents—

For Continental Europe and Great Britain—The George Fischer Steel and Iron Works, Schaffhausen, Switzerland

NICHOLLS

The ROYER "NDC"

Is a Profit Maker for Jobbing Foundries!

The New "NDC" Royer Combination is a profit making unit for every jobbing foundry because it provides a readily portable, highly efficient sand conditioning unit of high capacity. No pits or foundations are needed. Scrap, gaggers, burned cores, etc., are completely removed from the heap, lumps are broken, new and old sand are thoroughly blended, moisture is evenly distributed, permeability is increased 10 to 20 points and sand is double-aerated and cooled. Capacity is 20 to 25 tons per hour. Model "RC" Combinations for large foundries have a capacity of 40 to 50 tons per hour.

Let us tell you what users say about Royer Combinations —learn how quickly you can amortize a Royer from the savings they effect. Remember, only Royer Combinations and Sand Conditioners use the famous combing belt method of proper sand preparation.

Send for this new Catalog!

THE ROYER

ROYER FOUNDRY & MACHINE CO. KINGSTON, PA.

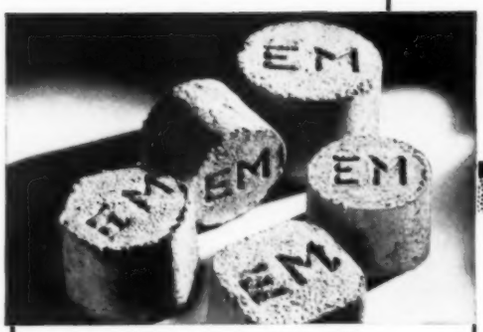
½ Good Scrap + ½ Poor Scrap + "EM" Briquets = Good Iron

This unsolicited letter from a foundryman tells how—

"We have used your briquets for the past four months and have had such good results we feel we should write you.

"We...used to be troubled with hard iron about every cast. At the present time we are using one half good scrap, one half poor scrap, and seven Silicon Briquets and two Manganese Briquets to every 1000 lb., and are having perfect results. We have abandoned the use of pig iron and find we are doing better financially as well as saving more work.

"We are willing to help you in any possible way we can so you can keep this product on the market, and should you ever need any recommendation as to the value of the product do not hesitate to use our name or have the people write us and we will gladly recommend it to them."



"EM" Silicon Briquets (round) contain exactly two pounds (large size) or one pound (small size) of silicon. "EM" Chromium Briquets (hexagonal) contain exactly two pounds of chromium. "EM" Manganese Briquets (square) contain exactly two pounds of manganese and one-half pound of silicon. Correct additions can easily be made by counting the right number of briquets and charging them on top of the coke in the cupola.

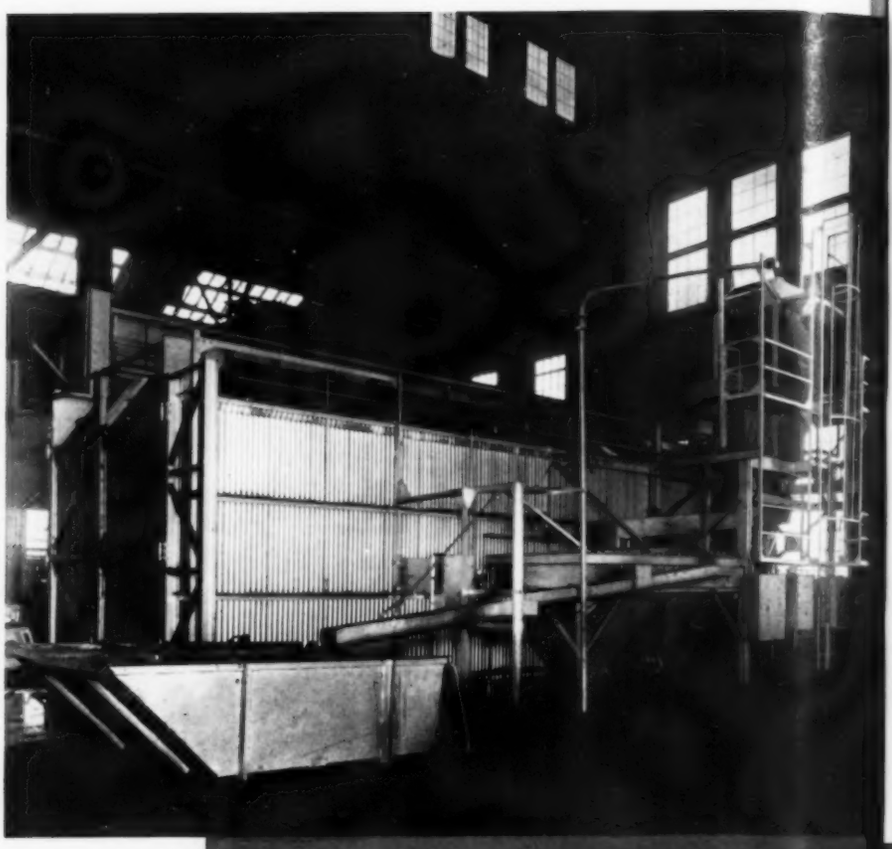
Electromet
Trade mark
Ferro-Alloys & Metals

We are grateful to this foundryman for writing us such a fine testimonial, and are happy that his experience confirms the results obtained with "EM" Briquets in many other foundries. You too can obtain better, more uniform iron at lower cost with these briquets. Write for "Briquetted Alloys in the Cast Iron Foundry," which tells more about "EM" Briquets and their advantageous use. You will receive a copy without obligation.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

The word "Electromet" and the letters "EM" are registered trade-marks of Electro Metallurgical Company.

By
RONALD WEBSTER
HYDRO-BLAST CORPORATION
CHICAGO



Cleaning

THERE has been widespread discussion among foundrymen, during the past five years, about hydraulic cleaning of castings. Likewise, there has been considerable misunderstanding in regard to the intrinsic advantages of wet cleaning, such as installation and operation costs, efficiencies and results.

Throughout this five year period of advancement in hydraulic cleaning and its attendant favorable effects on good foundry housekeeping, many foundrymen have failed to distinguish between hydraulic cleaning of castings in its broader sense, and HYDRO-BLASTING; which includes several functional foundry services, in addition to cleaning castings without creating dust. The misconception is frequently evidenced by the application of the HYDRO-BLAST trade name to all wet cleaning operations.

Hydraulic cleaning is merely an adaptation of the mining monitor principle and implies the cleaning of castings with large volumes of water alone at comparatively low pressures. HYDRO-BLASTING employs little water at extremely high pressures and with sand entrained in the stream, the increased work efficiency of entrained abrasive in the water having been determined in a series of laboratory tests.

THE HYDRO-BLAST METHOD

Specifically, HYDRO-BLASTING is a method of cleaning castings with high pressure water and ordinary sand from the foundry floor. When desirable special blasting sand and rust resisting chemicals may be used. Regardless of type of castings to be cleaned and cleansing agent selected, wet sand is entrained in the stream of water and discharged against the work at extremely high velocity, in excess of 18,000 feet or three miles per minute.

There are two essential purposes accomplished through the combined use of sand and water, and the patented design of the HYDRO-BLAST gun. First is the creation of a sluicing action which washes the entire surface as well as the interior of the casting

(ADVT.)

and scours it free from all sand and foreign substances. Secondly, only through extremely high pressure may sand be wet down without creating dust.

The HYDRO-BLAST method also makes possible, with relatively slight additional expense, the recovery of foundry sand in a washed and classified condition. Likewise the HYDRO-BLAST Corporation and the Whiting Corporation have cooperated in the development of a system whereby this recovered waste sand may be dried to a predetermined moisture content.

HYDRO-BLASTING EFFECTS CLEANING COSTS

In some instances, a definite dollar saving of 80 per cent or more may be effected on cleaning by the HYDRO-BLAST method. This economy is effected by knocking cores and sand blasting the work in a single operation rather than the several usual processes; one handling instead of many; elimination of core chipping; automatic dustless separation of coke or cinders and iron from the usable sand; economy of sand preparation, and the removal and disposal of fines.

HYDRO-BLASTING EFFECTS CASTING QUALITY

Castings can be cleaned thoroughly by HYDRO-BLAST without furring the surface and without leaving any residual abrasive in the surface pores of the metal. This scrubbing effect is inherent in the HYDRO-BLAST system of cleaning because the high velocity water accompanying the abrasive carries off fines which would otherwise lie in minute depressions of the metal. It is thus possible to clean interior surfaces so that there remains no problem of accumulated abrasive fines in operating mechanisms, such as gear housings, etc.

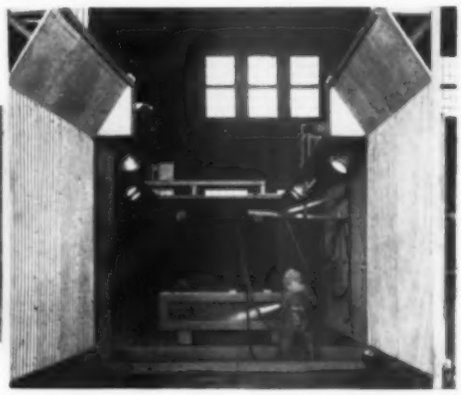
The HYDRO-BLAST method improves the quality of castings in another way when fully developed with sand washing and drying. The recovered sand is classified and, when dried to a specific moisture content, allows absolute control of sand by providing a fixed point from which "synthetic" sand may be built up. It is thus possible to make castings to closer dimensions.

HYDRO-BLASTING EFFECTS GOOD HOUSEKEEPING

The HYDRO-BLAST system of cleaning creates no dust, eliminates the dust which ordinarily accompanies the handling of used sand, and when developed fully with its sand reclamation system, can return washed and classified sand into the sand system without making dust. Water as such is not an answer to dust. A certain work energy must be applied to dust particles and water to make them combine, sometimes called wetting out. This effect can be most readily accomplished by contributing velocity either to the water or the sand at the point of their impingement against the casting. The smaller the dust particles, the greater the energy, or velocity which must be applied to wet them out. The extremely high velocity of the HYDRO-BLAST stream is sufficient to wet out all particles considered undesirable.

It has been proved that by use of this principle of high velocity the HYDRO-BLAST cuts down the dust in the air near the cleaning room, and air in the HYDRO-BLAST room is almost invariably cleaner than general foundry air.

CASTINGS HYDRAULICALLY



IN CONCLUSION

The HYDRO-BLAST Corporation takes this opportunity to recognize the open-mindedness of foundrymen which has been evidenced by their interest in our unconventional approach to an old foundry problem. We also take this opportunity to wish our many friends in the industry a Merry Christmas and a Busy and Prosperous New Year.

HYDRO-BLAST CORPORATION
3118 CLYBOURN AVE. • CHICAGO

(ADVT.)

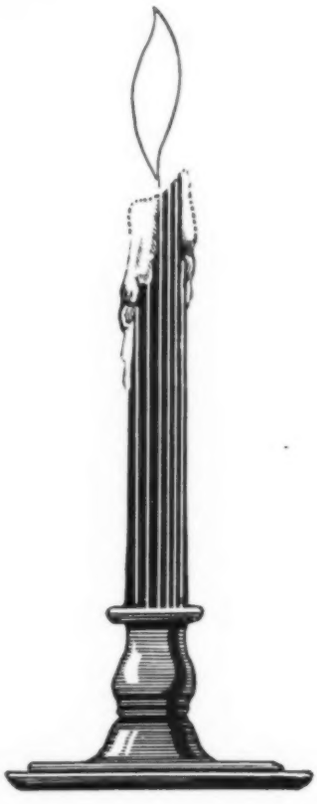
TWO men, two HERMANS, three hundred twenty-five molds in an eight-hour day proved to be successful PROFIT STRATEGY for a foundry operator who, before installing Hermans, found it difficult to compete for certain types of work.

You, too, can fill your foundry floors with profitable work made on Herman Molding Machines. Molds are made three to four times faster than by old methods and each mold is perfect. More interesting yet, the mold cost is but a fraction of the cost of producing them by old methods.

We invite you to look into the savings you can effect by planning your mold production with Herman equipment. You will not obligate yourself in any way.

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.



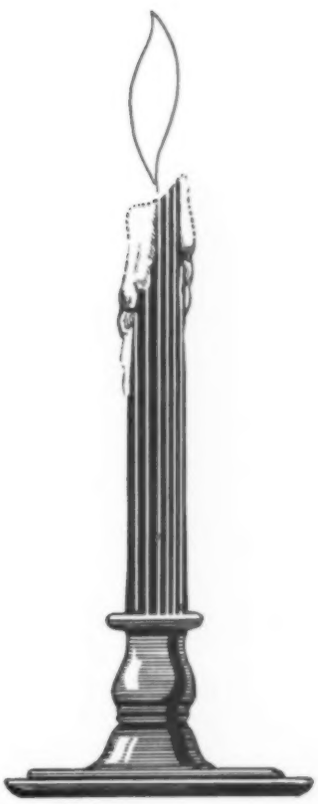
We take this opportunity

of extending to all foundrymen

our sincere good wishes

for a Merry Christmas

and a Happy New Year.



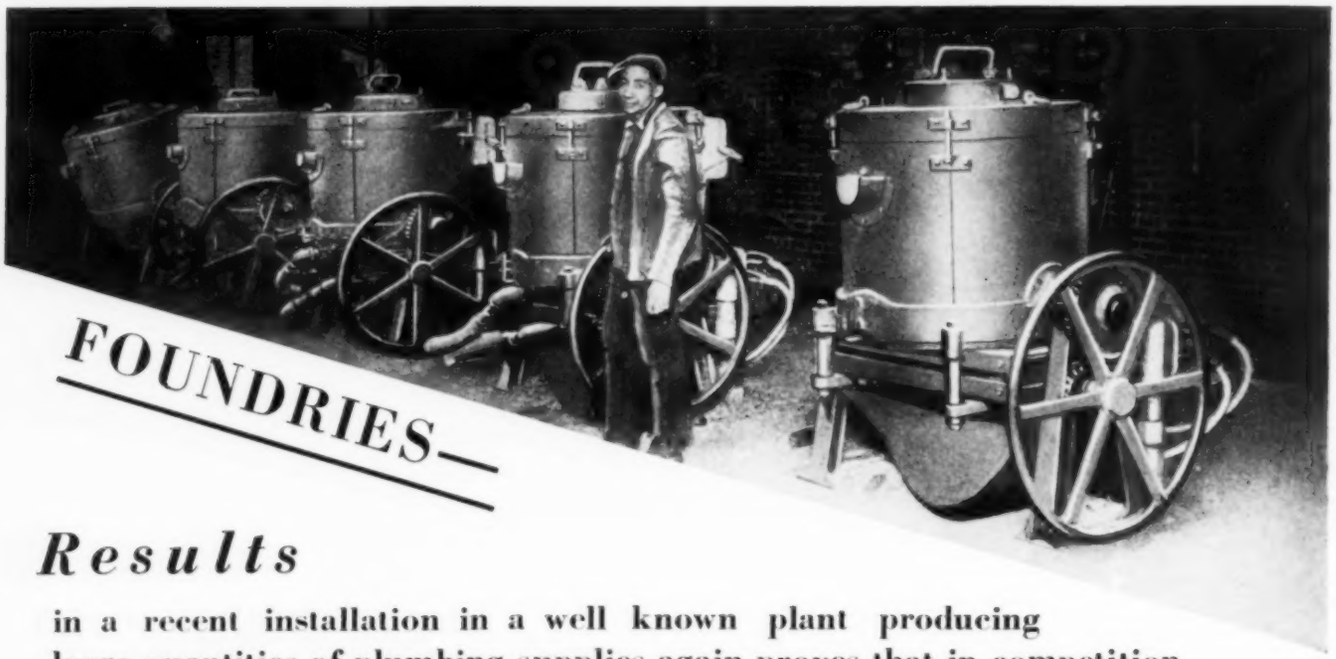
NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING *549 W. WASHINGTON BLVD.*

CHICAGO, ILL., U. S. A.

MANUFACTURERS AND SELLING AGENTS FOR CONTINENTAL EUROPEAN COUNTRIES—THE GEORGE FISCHER STEEL & IRON WORKS, SCHAFFHAUSEN, SWITZERLAND
FOR THE BRITISH POSSESSIONS, EXCLUDING CANADA AND AUSTRALIA—AUGUST'S LIMITED, HALIFAX, ENGLAND
FOR CANADA—DOMINION ENGINEERING CO., LTD., MONTREAL, CANADA. FOR AUSTRALIA AND NEW ZEALAND—GIBSON BATTLE & CO., PTY., LTD., SYDNEY, AUSTRALIA

AJAX WYATT MELTING EQUIPMENT

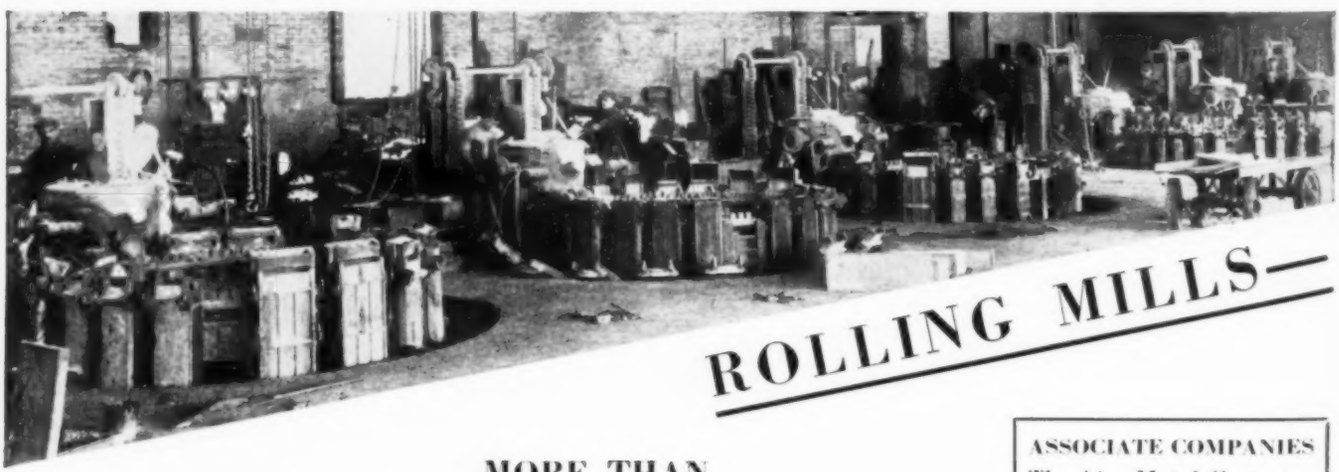


FOUNDRIES—

Results

in a recent installation in a well known plant producing large quantities of plumbing supplies again proves that in competition with any other method, electrical or fuel, AJAX-WYATT MELTING EQUIPMENT gives a better product, with improved working conditions and lower metal losses, at a

saving of over $5.00 PER TON



ROLLING MILLS—

MORE THAN

2500 tons of non-ferrous alloys melted in AJAX-WYATT furnaces daily in the United States alone.

AJAX ELECTRIC FURNACE CORPORATION

DIVISION OF THE AJAX METAL CO.

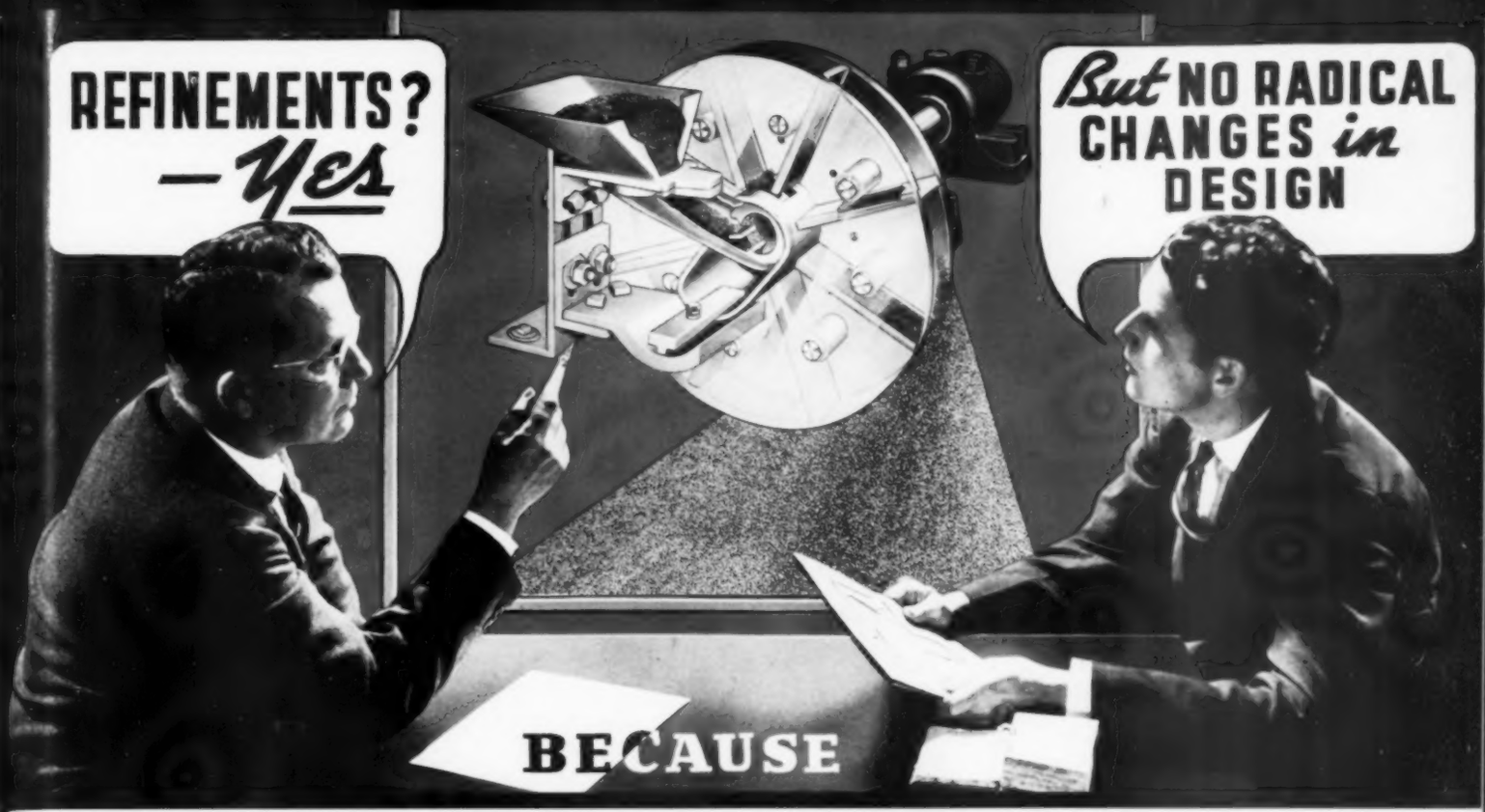
PHILADELPHIA

ASSOCIATE COMPANIES

The Ajax Metal Company
Non-ferrous ingot metal for foundry use.

Ajax Electrothermic Corporation
Ajax-Northrup induction furnaces for melting and localized heating and hardening

Ajax Electric Co. Inc.
Ajax-Hultgren Salt Bath Furnace and Resistance Type electric furnaces for all heat-treating operations.



WHEELABRATOR

Represents PERFECTED AIRLESS ABRASIVE BLASTING

A WHEELABRATOR Special Cabinet Used by a Prominent Auto Manufacturer for Cleaning Axle Shafts, Camshafts, Etc.

IN airless centrifugal blasting the essential element for peak cleaning performance and low operating cost is directional control of the abrasive blast.

The patented WHEELABRATOR control mechanism solves this to perfection. That is why the basic design of the WHEELABRATOR has remained unchanged since it was invented in our laboratory.

The soundness of the WHEELABRATOR principle is demonstrated by the fact that more than 875 WHEELABRATORS—all using the same parts—all operating the same way—have been sold throughout the world within the last 5 years.

THE American FOUNDRY EQUIPMENT CO. ★ 505 S. BYRKIT ST. MISHAWAKA, IND.

Always at your elbow!

● Some foundrymen think of the Republic Pig Iron Metallurgist only as a "bug hunter." They have seen him at work in foundries, tracking down and ferreting out the "bugs" which creep into foundry operations between charging of the cupola and cleaning of finished castings to cause troubles, rejects and high production costs.

But he is more than a trouble shooter — he's a profit hunter. While in the foundry, he constantly looks for — and often finds — ways and means to help foundrymen improve products, increase production output and realize greater profits.

He is ready to help you — to be always at your elbow when you need him — if you will request his services. The only obligation will be his — and that to aid you.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO

UNION DRAWN STEEL DIVISION • BERGER MANUFACTURING DIVISION • STEEL AND TUBES DIVISION
NILES STEEL PRODUCTS DIVISION • TRUSCON STEEL COMPANY

REPUBLIC STEEL
REG. U. S. PAT. OFF.

"REPUBLIC" (Youngstown, O.) *Bessemer and Basic*

"PIONEER" (Birmingham, Ala.) *Foundry and Basic*

"McKINNEY" (Cleveland, Ohio) *Foundry, Malleable and Basic*

"NIAGARA" (Buffalo, N. Y.) *Foundry, Malleable and Basic*

and
THE FAMOUS
"CHATEAUGAY"
(Buffalo, N. Y.)
Low-Phosphorus, Copper-Free

MORE THAN A MILLION TONS A YEAR OF HIGH QUALITY MERCHANT IRON

REPUBLIC PIG IRON

TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS

When writing Republic Steel Corporation for further information, please address Department FN.

Operating Foundry at Chicago Museum Is an Inspiration

THE operating exhibit of the foundry industry, which is housed in the magnificent building of the Museum of Science and Industry, Jackson park, Chicago, should be a source of great pride to the entire foundry industry and the cause of extreme satisfaction to the various foundries, equipment and supply manufacturers, associations, societies, and the many individuals, whose contributions in time, materials and money made the exhibit possible. The industry is indeed fortunate that the museum management has seen fit to allot sufficient space in one of the finest displays of its kind ever assembled for a demonstration of the science which has developed in the foundry art.

The thousands of visitors who will pass through this museum annually cannot help but obtain a most excellent impression of the foundry industry and its products. Modern equipment and modern methods forcefully tell the story of this basic industry. Youth may find in this display the doorway to a career. All who see the working exhibit must carry away a greater respect for castings, found everywhere in the civilization of today, and constantly being improved to meet the demands of the world of tomorrow.

High above a display of the elements located under the central dome of the building may be found this statement: "Science discerns the laws of nature, industry applies them to the needs of man." Foundrymen are proud to have a part in this great humanitarian enterprise.

Castings Production High

OPERATIONS continue at an exceptionally high rate in all branches of the foundry industry. Many shops are finding great difficulty in meeting immediate demands of customers. Much new business, of necessity, is being accepted with delivery dates several months in the future. This situation is especially true in foundries supplying castings for the production of railroad equipment, electrical generating units, etc., where the recent spurt in buying has eclipsed by far any similar movement in the past few years. It is interesting to note that at the middle of November, pig iron production rapidly was approaching a record rate, and that demand for pig iron and coke on the part of foundries was sustained.

How long the present rate of foundry operations will continue remains a matter of conjecture. Despite the repeal of the arms embargo and the placing of large orders for airplanes by the belligerent nations, the volume of business from Europe in which foundries may participate will not be heavy as long as the war continues in the direction of the first two and a half months. Should a war of destruction, comparable to the World war, be undertaken, it is doubtful that demands upon American industry for materials of war would even approach the 1915-1916 levels. Therefore the future volume of business in the foundry industry depends on continuation of domestic demands, and on the movement of castings into consuming channels, and not into stock bins for future fabrication.

Added to the many problems facing foundry operators is that of half-baked labor and employment laws. In all fairness to employers and to the many still ambitious unemployed whose greatest wish is a job, these laws should be overhauled.

Business at a Premium

CLAUSES, frequently peculiar and quite often potentially ruinous, now and then crop up in acceptances provided by the customer. As in the case of the insurance policy, it always pays to read the fine print before attaching a signature. The most recent gem along this line has been unearthed by W. W. Rose, executive vice president, Gray Iron Founders' society, Cleveland, and was presented in the October *Bulletin* of that society.

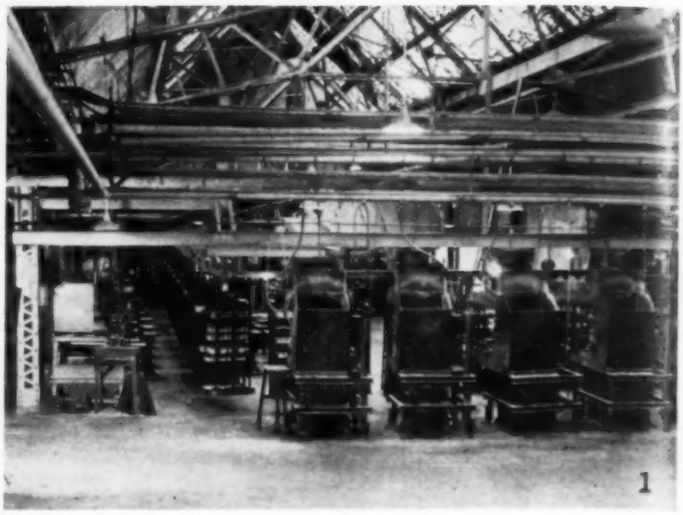
How many foundrymen are accepting business under terms as ridiculous as the following:

> You shall indemnify, save harmless and defend us from all liability for loss, damage or injury to persons or properties in any manner arising out of or incident to the performance of this contract.
>
> Whenever you shall by virtue hereof have in your possession our properties you shall be deemed an insurer thereof and shall be responsible for its safe return to us.

Frank G. Steinbach
Editor

PROGRESS in the mechanization of a malleable foundry engaged in the manufacture of castings for the automotive industry is well illustrated at the plant of the Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich. With the motto, "If it has been done for 3 years, it must be wrong," the management of that organization constantly analyzes its practices in every phase of operation.

Recently William H. Doerfner, general manager of the Saginaw Malleable division, presented an interesting illustrated discussion of both new and old methods at Saginaw, before the Quad-City Chapter of the A. F. A. Through the kind co-operation of Mr. Doerfner, THE FOUNDRY is permitted to present pictorially this story of progress in a modern malleable foundry.



PRODUCING Malleable Castings IN A

Fig. 4 (Left)—Filling 3-ton electric crane from cupola forehearth. Crane transfers metal to direct-arc electric furnace where it is superheated and the metallurgy of the iron is controlled further. Temperature of iron at forehearth is 2700 degrees Fahr., and it is raised to 2840 degrees Fahr. at the electric furnace. This type of melting permits continuous pouring operation

Fig. 5 (Right)—A 1-ton electric crane ladle filled at the electric furnace. The iron is now at proper temperature for pouring. The 1-ton cranes are employed to distribute the iron to the pouring conveyors

Fig. 1 (Left)—Coreroom showing machine relation to indexing conveyor carrying cores through oven. Around conveyor are 16 blow, 5 squeeze and 5 rollover machines

Fig. 2 (Below)—Former method of making differential case core. Sand, level with corebox bottom, required lifting to fill box. After peening, a plug driven into top formed upper core portion. Then all 4 sections were drawn and placed on drier. Production 80 per hour

Fig. 3—New method using specially designed squeeze machine. Three parts of box mounted on machine with only one part to be drawn manually. Sand is level with box top. After filling box, the operator swings squeeze cylinder into position and the plug is forced into top. Drier controlled by operator's right hand is placed, and front section of box drawn, leaving finished core ready for placing on conveyor. Production is 250 cores per hour

A MODERN FOUNDRY

Fig. 6 (Right)—A 300-pound covered pouring ladle taking iron from 1-ton crane. Iron pourer spots ladle on a car which is moved forward or back to prevent spillage. Car is operated by lever as shown in illustration

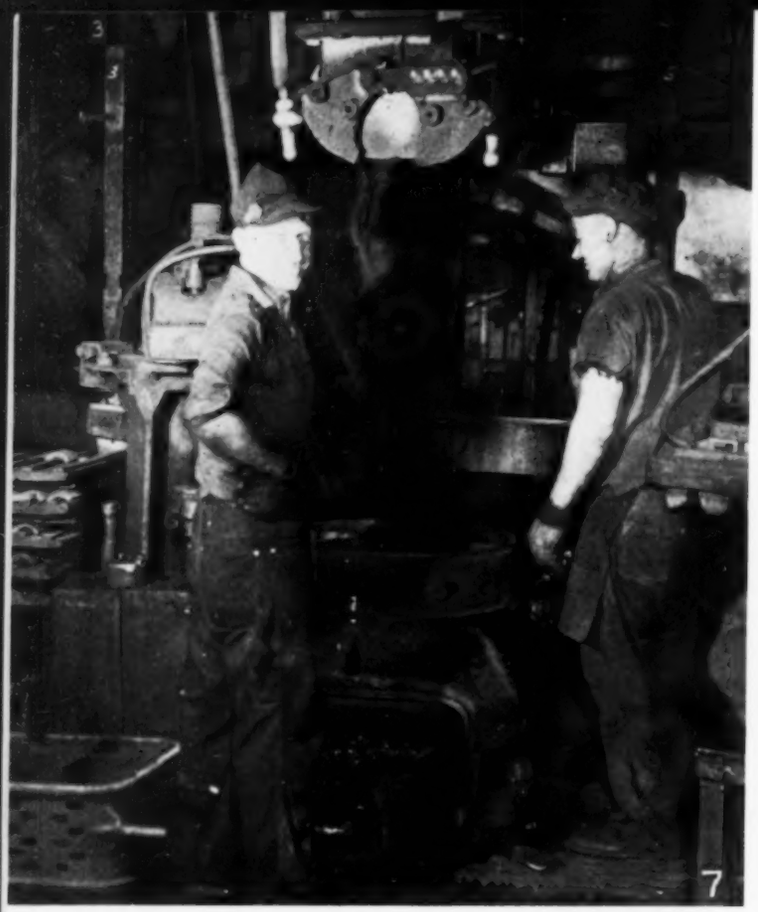


Fig. 7 (Left)—Filling cope flask on machine line. Mold is jolted, struck-off and squeezed. When pattern draws away, cope is carried out and placed on drag. Molder has assistant to help carry molds, and set chills and cores. Production is 100 molds per hour

Fig. 8 (Below)—Continuous conveyor carries molds to pouring area. This unit produces 500 molds per hour from 5 jobs. Seven men on synchronized conveyor readily pour molds. Line produces 11½ tons good castings per hour

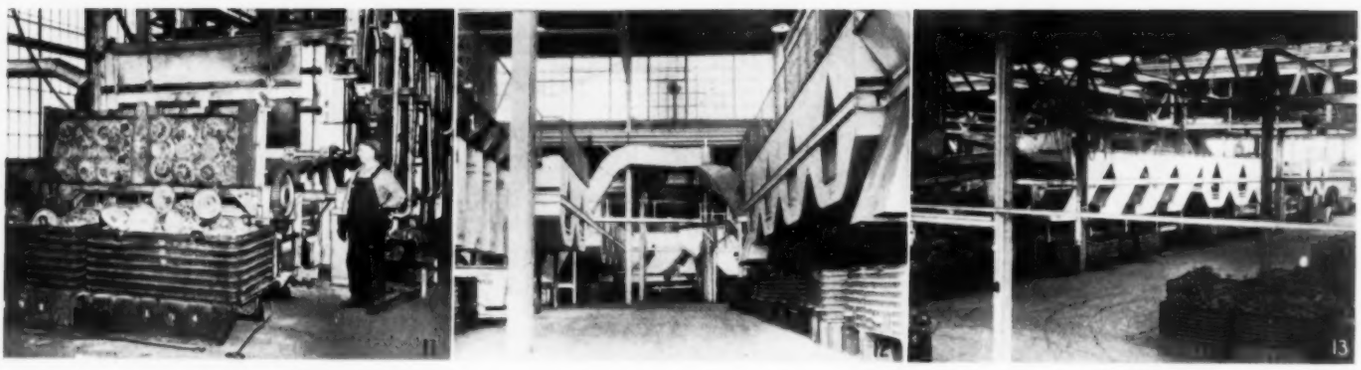


Fig. 11—Castings being dumped from trays which carry them through a controlled atmosphere, short-cycle annealing kiln where it is possible to anneal in 30½ hours. Fig. 12—Annealed iron is dumped on a belt which conveys it over grinding room set-up. Here it is sorted into hoppers from which castings are ground. After grinding, the castings are transferred to a conveyor which takes them to a wheelabrator for cleaning. Fig. 13—Side view of same arrangement showing overhead belt and hoppers in respect to grinding machines which are mounted on a platform

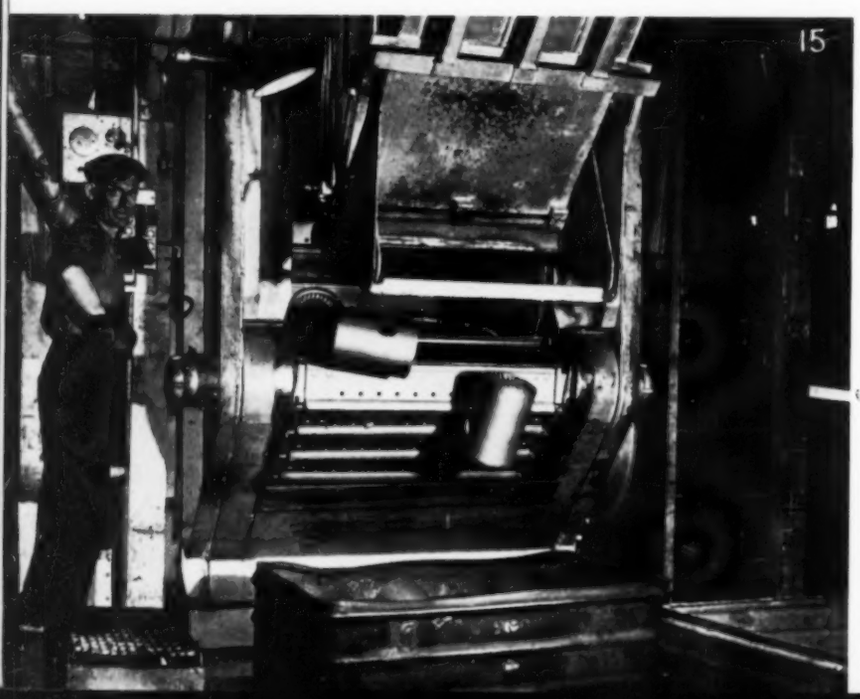


Fig. 15 (Left)—Unloading clean castings from wheelabrator. Castings from grinders are taken over the cleaning equipment on a chain conveyor. From the conveyor the boxes are dumped into hoppers located over each machine. After clean castings are unloaded from machine, an air valve opens front of hopper allowing uncleaned castings to slide into machine. Production is 6 tons per man-hour

Fig. 16 (Right)—Finishing department where castings are sheared, pressed and finished for shipment. Castings are brought from cleaning room in dump boxes by high lift truck which permits castings to be dumped into service hoppers at shear machines or presses. Foreground shows truck refilling press hopper

Fig. 9.—Poured molds travel through cooling zone to shakeout where air ram pushes them on a vibrating screen to remove sand. Castings fall into bucket which is raised by air hoist to hook onto overhead conveyor carrying it to annealing room.
Fig. 10—Experimenting with water spray to reduce temperature so that castings can be packed directly for annealing

Fig. 14 (Above)—View shows a grinding operator working from a hopper which feeds the castings within reach. This reduces the time required for grasping work, and also makes job much easier. Since machines are mounted on a platform, and the disposal box is on the floor directly under the hopper, disposing of finished casting is accomplished merely by dropping it while reaching for the next casting to be ground. Another advantage is that no time is lost by waiting for a box to be changed because two empty boxes always are in position for receiving the finished castings

Malleable Castings

Fig. 17 (Below)—Operator shearing a gate. Left hand has control of next casting while right hand is holding casting being sheared. That is due to the hopper setup which brings castings within a short distance of the die. Shearing is performed rapidly, and in some cases as high as 2000 gates are being sheared an hour

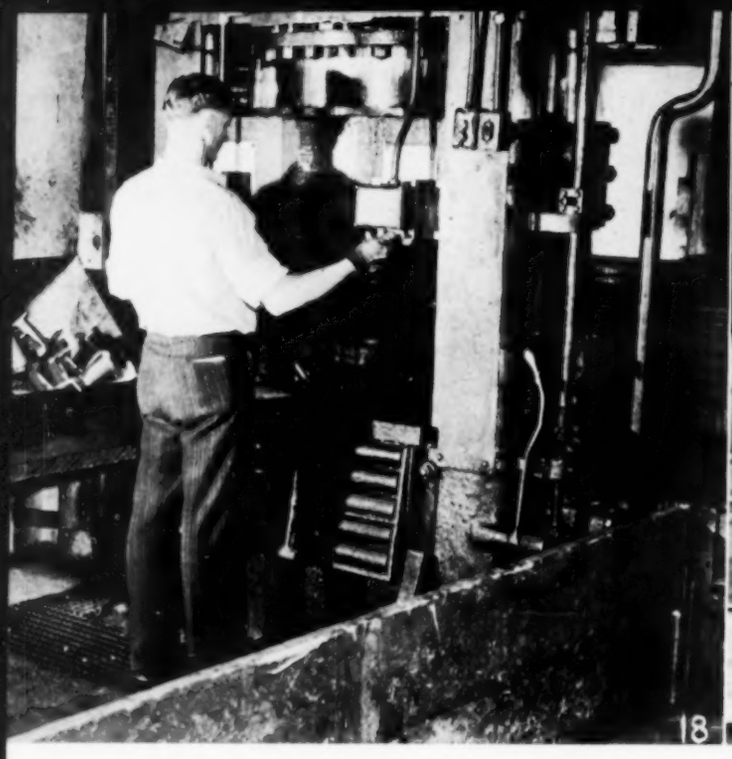


Fig. 18 (Above)—Castings are straightened hydraulically. Unpressed castings are in hopper, and after pressing are placed in bin at operator's right. Production is 760 per hour

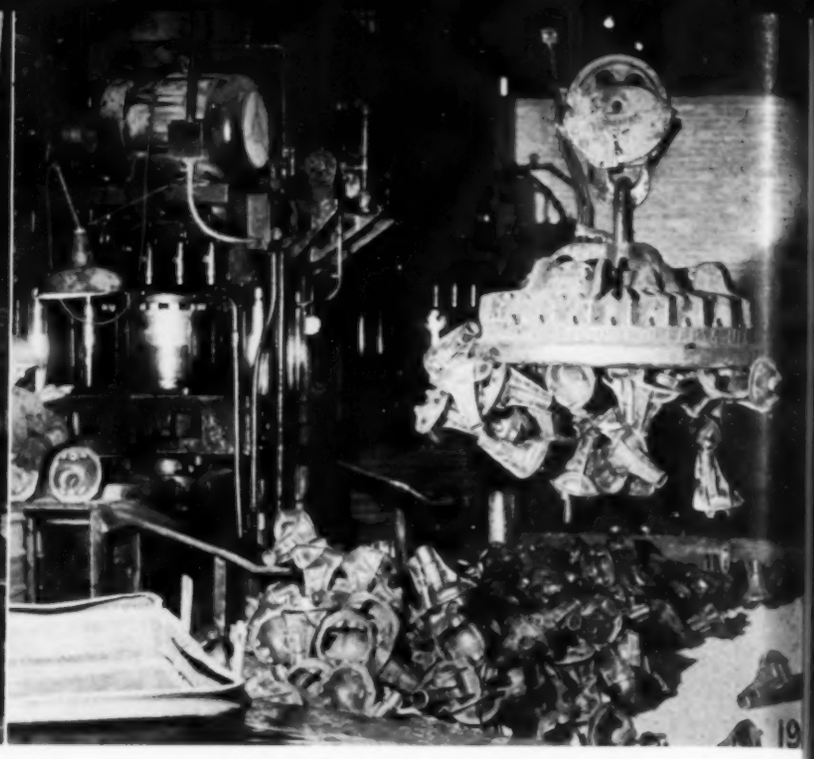


Fig. 19 (Above)—Finished castings ready for shipment. Magnet suspended from crane is taking load of finished castings to storage or to hopper where they are counted

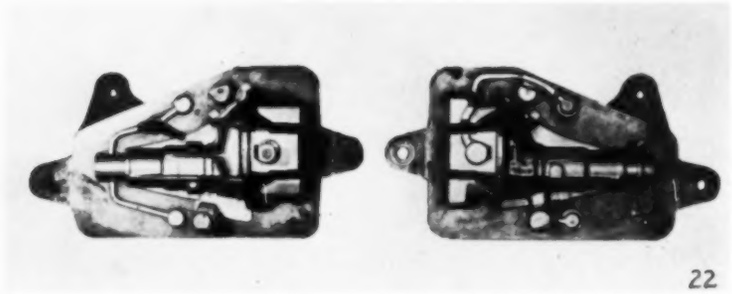
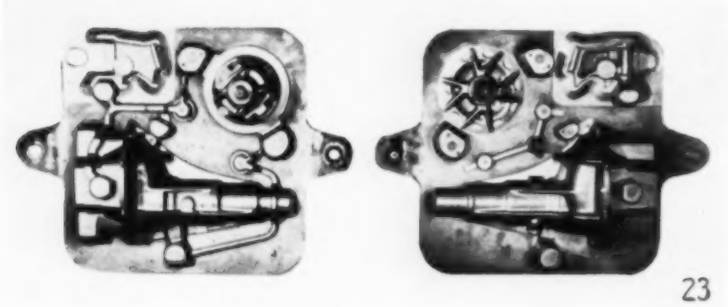


Fig. 22 (Above)—Old, single, differential carrier pattern from which 100 molds per hour were produced. Fig. 23 (Below)—Composite mold contains carrier, differential case and frame bracket. Bracket is insert which may be replaced by other castings if desired



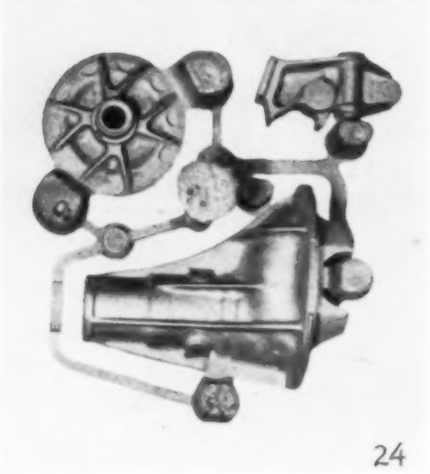


Fig. 24 (Above)—Gate of castings from composite mold. Number of molds per hour not reduced, but net good castings increased from 2351 to 3988 pounds or about 65 per cent. Yield per gate was increased from 59 to 64.2 per cent

Fig. 27 (Below)—Layout of latest composite equipment. All casting dimensions held below 0.001-inch. Pattern specifications call for machining of all partings where possible. Use of composite patterns necessitates holding dimensions to closer limits

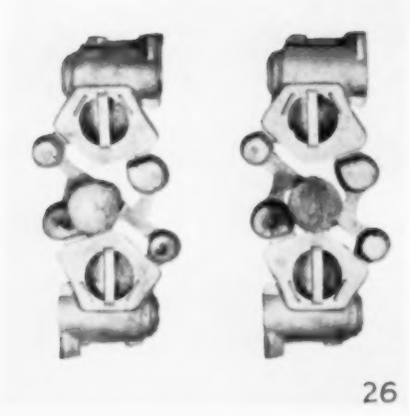


Fig. 26 (Left)—Gate of castings from pattern in Fig. 25 showing clearly the two sprues. Two sprues are necessary on this job to minimize iron flow and thus eliminate misruns. Net good castings weigh 16.4 pounds with a gross of 34.0 pounds, leaving a yield of 48.3 per cent

Malleable Castings

Fig. 20 (Above)—Showing the castings being counted for shipment. Since castings are thrown to a lower level, much of the fatigue has been removed from the operation

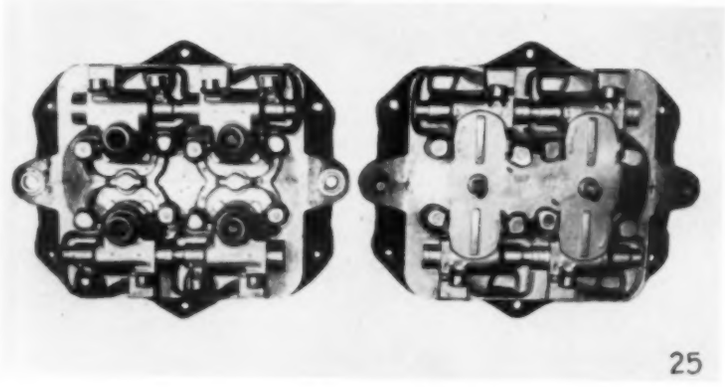


Fig. 25 (Above)—This view illustrates a 4-ton, two sprue housing pattern. All four patterns on the plate are the same

Fig. 21 (Above)—Illustrating how castings are loaded into gondolas for shipment. Loading is accomplished through use of high lift trucks and hoppers shown. After car is loaded, the castings are covered with sheets of heavy building paper to prevent rusting

Fig. 28 (Below)—Drag equipment made from layout. Pattern requires 24-inch circular flask, 7-inch cope and 7-inch drag. Flask and sand cope or drag weighs only 210 pounds. Pattern made of 3 identical sections, each containing castings making complete Chevrolet steering gear assembly; housing, flange and adjusting nut. Sections are interchangeable permitting substitution of other castings when desired

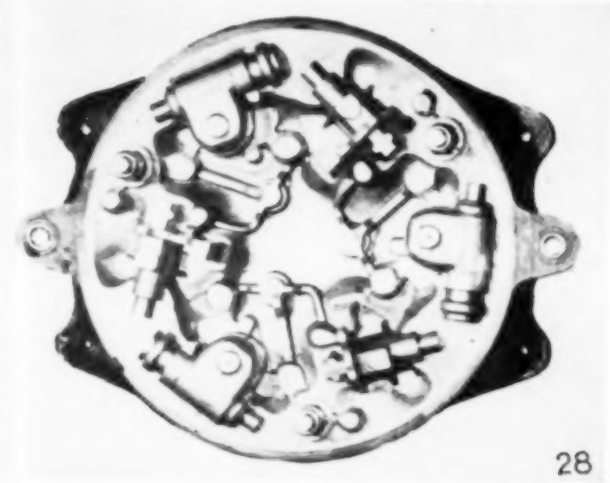
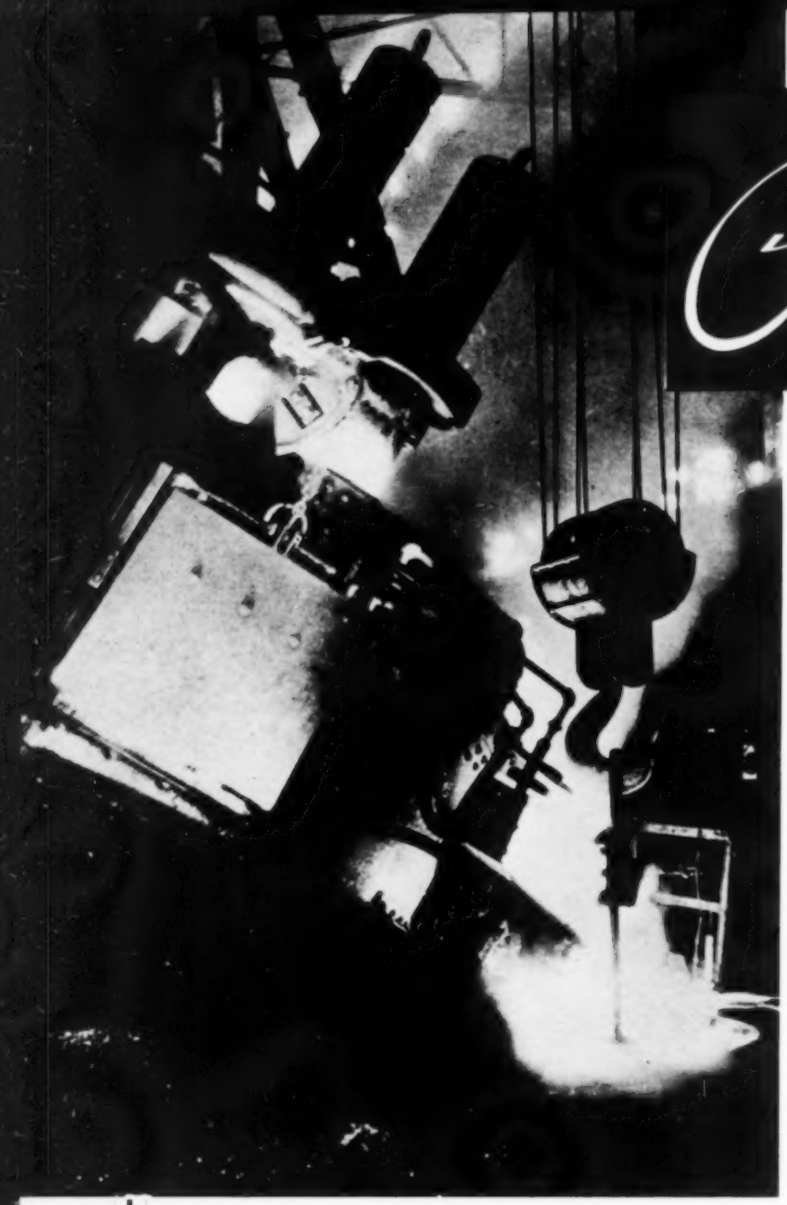


Fig. 29 (Right) — Gate, equidistant from all extreme points, permits pouring mold from a single center sprue. Iron flow from the sprue is radial and distribution basically is uniform. Pouring time is reduced to minimum, eliminating misruns and increasing pouring efficiency



Castability OF A

By R. J. WILCOX
Michigan Steel Casting Co.
Detroit

This article is from a paper presented at the 1939 Joint Foundry Conference of the Detroit Chapter of the A.F.A. and Michigan State College at East Lansing, Mich.

CASTABILITY in this discussion means the relative ease or difficulty with which a particular metal or alloy may be formed into castings reasonably free from internal and external defects. Factors affecting the castability of alloy steel include: Fluidity; character and degree of shrinkage and solidification; dissolved gases—capacity for and ease of degasification; susceptibility to cracking; effect on mold refractories.

Alloy steel castings are defined in the A.F.A., 1935 *Cast Metals Handbook*, as "Castings made from a steel to which one or more special elements have been added, or to which more than the usual percentage of a normal element (such as manganese or silicon) has been added." These materials have been subdivided further into low alloy cast steels, containing special alloying elements totaling less than 8 per cent and high alloy cast steels, containing 8 per cent or more of special alloying elements. This class includes the heat and corrosion resistant steels and austenitic manganese steels. Some of the highly alloyed heat and corrosion resisting materials contain only minor quantities of iron and are classified by some as nickel base alloys and not as alloy steels.

Fluidity of the low alloy steels as in the plain carbon steels essentially is a function of melting practice. However, certain alloys have inherently poorer characteristics in that respect than the carbon steels, while others have somewhat superior properties. In acid electric melting as with carbon steels, it is desirable to melt under oxidizing conditions, characterized by low percentages of silicon and manganese (residual amounts) remaining in the molten or base metal bath prior to the period of deoxidation and finishing. When such conditions have been obtained in the bath and sufficient temperature attained, deoxidation is effected and the requisite amounts of alloying elements are added to produce the desired composition. A single slag is carried throughout this practice. Desirable slag characteristics are maintained by the use of dry lime as required.

Silicon Greatly Enhances Fluidity

Ladle deoxidation practice is substantially the same as used for carbon steels and consists of aluminum and calcium-manganese-silicon alloy. The use of aluminum in ladle deoxidation has been reported in recent papers.

Certain elements have inherent properties of enhancing the fluidity characteristics of alloy steels. Among these are carbon, manganese, silicon, copper, sulphur and selenium. The use of these elements is limited in extent depending upon the mechanical characteristics desired to be developed in the final product. Thus, more than normal amounts of sulphur or selenium usually are not permitted except in cases requiring free machining or nonseizing characteristics.

Silicon greatly enhances fluidity and contrary to long established prejudices concerning high percentages of that element, silicon alloys containing up to 1 per cent silicon have useful and desirable properties. Silicon steels are characterized by good fluidity, cleanliness and freedom from gases. Other

silicon alloys such as the manganese-silicon and copper-silicon materials offer desirable combinations of fluidity and pouring characteristics with good mechanical properties and appear well adapted for foundry application.

Use of copper-silicon alloys in automotive service is well known and it is reported that copper adds materially to fluidity properties. Table I indicates the effect of silicon on the mechanical properties of a manganese-silicon alloy in increasing quantities of silicon from normal amounts up to about 1 per cent.

For the development of higher mechanical properties it usually is necessary to use such alloying elements as nickel, chromium, molybdenum, vanadium, titanium and others, either singly or in suitable combination. These alloys generally are not quite as fluid as the carbon steels in the same carbon, manganese and silicon ranges. For purposes of comparison Tables II and III indicate mechanical properties of typical alloys of that group as compared to the silicon alloys previously described.

Pouring temperatures of the low alloy steels usually approximate those required for carbon steel practice. Casting temperatures usually range between 2750 and 2950 degrees Fahr. depending upon the alloy and size of casting. Usually it is desirable to pour at the lowest temperature that will maintain freely flowing conditions, as indicated by the absence of wrinkles, or cold shuts.

Dangers from porosity or blowholes in low alloy steels are present to about the same extent as in the carbon steels. With good melting practice, correct ladle deoxidation and controlled molding sand, gas cavities usually are not present to a serious extent. Precautions observed with carbon steels are the same for the alloy steels.

Shrinkage allowances for pattern construction are usually ¼-inch per foot. Gates and risers are about the same in size as those used in carbon steel practice. Due to a rather abrupt change in these alloys from the liquid to solid phases gating arrangements that will introduce hot metal into the risers are desirable. Insulating and heat generating coverings for risers are also effective in maintaining liquid metal in the head to promote feeding.

Repair of casting defects in alloy steels is more difficult than in the plain carbon steels and in many cases entirely impractical. Extreme precautions are necessary to prevent the formation of shrinkage cavities, sand erosion or other defects necessitating welding repairs. Average yield of good castings from metal charged in the furnace possibly is somewhat lower in alloy steels than with carbon steels.

Cracks may be due to several causes and may be either hot tears or cold cracks. Precautions used in carbon steel must be observed with alloys to prevent hot cracks or tears.

With the exception of the silicon alloy, most of the alloy steels are air hardening to varying degrees due to a lowering of the critical temperatures. Internal strains are present in most cases in the as cast condition and frequently it is necessary to resort to preliminary stress relief heat treatment before starting cleaning operations. Soft wheels are required for grinding operations to prevent heat checking.

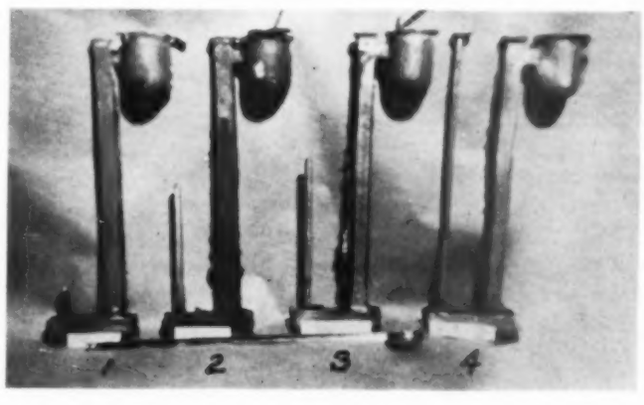
Green sand, skin dried and dry sand practice may be employed. (*Please turn to page* 94)

Table I

Silicon and Tensile Properties

Heat	Carbon	Manganese	Silicon	Yield	Tensile	Elong. 2"	Red. of Area
979F	0.29	1.22	0.38	40,000	72,500	32.0	56.0
25450B	0.26	1.14	0.62	40,900	76,625	32.0	55.2
25439B	0.29	1.20	0.74	43,575	79,750	29.0	49.2
25463B	0.28	1.18	0.81	45,950	80,375	30.0	53.0
25428B	0.28	1.19	0.88	47,050	79,350	31.0	54.9
26288B	0.26	1.15	0.94	52,450	87,525	28.0	40.4
26528B	0.27	1.26	1.04	55,350	94,575	22.5	30.2

All bars normalized 1 hour at 1650 and drawn 1 hour at 1250-1300 degrees Fahr.



Fluidity is measured by distance metal flows up in the small member. With metal poured at 2800 degrees Fahr. No. 1 shows a low carbon steel. No. 2 is S.A.E. 6150. No. 3 contains 29 per cent chromium and 9 per cent nickel. No. 4 contains 35 per cent nickel and 15 per cent chromium

METHODS OF TESTING BONDING CLAY

By N. J. DUNBECK
Eastern Clay Products Co.
Eifort, O.

THE molding sand research committee of the American Foundrymen's association has done excellent work in developing and publishing the procedure to be followed in testing clay bonds and sands. Despite this work, the usual foundry testing of clay bonds seldom is more than 75 per cent accurate.

Few foundrymen realize the importance of the many variables which affect results in testing bond clays. Possibly most foundrymen know that the variables exist but do not appreciate the extent to which they may affect results. In this discussion, the precautions mentioned in the standard A. F. A. test procedure are emphasized and a few additional precautions suggested. The basic details of proper method of testing are not here repeated as they may be obtained from the volume *Testing and Grading Foundry Sands and Clays* published in fourth edition in 1938.

Sand Test Samples Must Be Dry

If a small scale laboratory test is to be made, clean unbonded silica or core sand is recommended. The one most essential point to be noted is that the sand must be bone dry. Moisture in the sand is important in that it reduces the rate at which any clay bond distributes. It also is important in that synthetic sands show maximum strength when tempered on the dry side and there is a critical range in which strength increases rapidly as moisture content is reduced.

A difference of 0.5 per cent in water content between two sands which appear to be equally wet or equally dry may not sound important and would be difficult to notice by observation only. That same one-half per cent difference in water content of the sand may cause as much as 18 per cent in strength developed. This difference may be greater than actually exists between the correct strengths of the bonding materials being tested and creates an obviously unfair condition for the clay bond which is tested with the wetter sand.

If a large scale foundry test is to be made and it is desired to use regular heap or system sand, truly accurate results may be obtained only by drying the sand. This sand must be dried at not over 250 degrees Fahr. as there may be dehydration of some clays as low as 300 degrees Fahr. The careful drying of such sand is a cumbersome job and satisfactory results may be obtained by using a heap or system sand which is as uniform in moisture as available and running three batches of sand with each bond being tested. Each bond should be tested alternately and the results averaged.

The total quantity of sand in each batch should be weighed or measured carefully. The practice of measuring batches by shovel or scoop at the time of loading mill is not satisfactory as observed errors of as much as 10 per cent in weight have resulted from such measurement.

Clays May Differ in Weight

The finer a clay is ground the lighter in weight it will be. Different clays of the same fineness may differ sharply in weight. Therefore, it is essential that the addition of clay bond be made by weight and not by volume.

Most foundrymen test clay bonds as received, without consideration of the moisture content of the bond. Clay bonds vary from 4 to 12 per cent in water content as received. The moisture in clay has an important effect upon the rate at which the clay distributes through the sand and upon the strength developed. This is particularly true with some types of clays and there are cases where a clay containing 9 per cent of water may deliver 20 per cent less strength than the same clay with 6 per cent of water.

Moisture in most clays varies somewhat depending upon the time of the year. Fire clay bonds tend to dry out in storage and a difference may be noted between the strength of the last dry clay in a bin compared to the wetter clay in a fresh carload. If both clays were dried before testing there might be no difference in strength.

Most clay producing companies ship samples in small cloth bags. During warm weather or in a warm laboratory, the clay dries out to a marked extent. It is misleading to test such (*Please turn to page* 104)

AVOIDING DEFECTS IN THE NONFERROUS FOUNDRY

By N. K. B. PATCH

DEFECTS in nonferrous castings are of two major classes, those due to design and those resulting from the many variables in the process of preparing molds, melting metal and casting. In considering those of the first class, it is well to remember that many men responsible for designing castings have not had wide experience in the foundry and thus are not sufficiently well informed as to foundry difficulties that a given design may entail.

Frequently co-operation between designer and foundryman will result in minor changes of design which in no way detract from the serviceability or convenient operation of the casting, and yet make a remarkable saving in the hazards of foundry production, frequently resulting in a marked saving of cost in the final casting. In spite of the engineers' demand for intricate and highly complicated designed castings, the regular routine production has been worked out to a point today where many castings are produced at relatively low cost that might have been considered extremely expensive to make only a few years ago. Even here many economies frequently are possible at the expense of no change in the satisfactory functioning of the casting and yet at a relative increase in efficient production and a consequent economy in cost.

Co-operation Required in Designing

Sudden change of section from a heavy to a light or vice versa, invariably is a source of possible defect in a casting, particularly when that casting is to be made in what might be termed the high shrink alloys. Location of heavy bosses or extra heavy sections at points in the casting impossible to reach by proper risers, may prove troublesome to the foundrymen unless the designer, patternmaker and foundrymen had an opportunity to co-operate in planning the production of these castings before rather than after the defects were discovered in the cleaning room.

A designer will do well to discuss his designs with the foundrymen before finally approving them for production of the pattern equipment. In doing so the kind of material to be used in making these castings should be a matter of first consideration. If made of aluminum bronze, manganese bronze, or silicon bronze, which must be fed during solidification, one design may not be desirable, whereas another may be produced simply at a relatively low cost. However, if the castings are to be red brass or some of the yellow brasses, where heavy risers are not so important, and where the shrinkage is somewhat less than in the previous instance, the design may be quite different and yet produce economically and with a minimum of foundry troubles. If castings must be produced in permanent molds, or must be chilled for the development of specific structure to meet some service demand, the design must make it convenient for the foundryman to apply the chills at their proper location with a minimum of hazard and a minimum of labor cost so that the resulting castings will be produced at an economical price.

Economy Measure May Prove Expensive

Some engineers, over anxious to save cost of material, reduce wall thicknesses or cut down on machining allowance. They believe that the saving in relatively high priced bronzes and brasses will result in economy when it may be the direct cause for an increase in the cost of production, resulting in the wiping out of all or at least a major part of the saving in metal.

A happy medium exists between the casting with an excessively thick wall, or an excessive allowance for machining and that in which the paring down has gone too far. Adequate fillets always should be provided where thick and thin sections join one an-

other. Change from thin to thick sections should be gradual instead of sudden.

Where castings are to be produced on a mass production basis, frequently the case under modern conditions, it is particularly important that every possible precaution be taken to insure ease of production by proper design; ease of manufacture after the castings have been produced by proper design, and efficient operation of the castings under production, all by proper design. This means that the designer should discuss his design with the foundryman so that the foundryman's problems will be anticipated and proper measures adopted. He should discuss debatable features with the manufacturing or machine shop departments so that provision may be made in the design for rapid tooling and other features leading to the most economical manufacture of parts into useful castings.

Important details are connected with the casting of each of the different types of bronzes and brasses produced in the modern bronze or brass foundry. Consequently, it is well to discuss design problems with men versed in the production of the type of bronze or brass from which it is proposed to make the castings. The designer in choosing a given composition for a type of service, will insure the best success with that part he is designing if he consults those who are versed in these different compositions, their uses, peculiarities, relation to their mating materials and their peculiar foundry hazards, before establishing the final choice of material for a specific service.

Consider Foundry Problems Involved

Having made the decision on the kind of material, the designer then must consider the foundry problems entailed in making satisfactory castings in that particular composition. The information can be secured only from those who are familiar with the foundry hazards of that alloy, the requirements for the most economical production of the casting. Joint planning of the designer, the patternmaker and the foundrymen, eliminate as far as possible the hazards due to design that may cause an excessive defective casting loss. The final design should produce castings at maximum speed so that the final cost may be as economical as possible and thus insure maximum satisfaction.

In discussing the choice of composition with the foundryman, the question of desirability of chilling or heat treating the castings must be taken into consideration. Frequently the design may be changed without loss of efficiency of the casting itself. The change may result in marked savings in the cost of the chilled casting, if chilling is desirable; or in heat treatment, if that is to be one of the steps in the production of the final cast part.

Discussing the design with the patternmaker, the engineer may be able to alter his design without altering the efficiency of the resulting casting. The patternmaker through that change in design may produce a pattern that will aid materially in production. The casting may be produced in a two part mold; whereas, the previous design required a three or more part mold, or an excessive number of cores, etc. The designer, before finally approving a design for a casting, can build for substantial economies by co-operating with those who are going to produce the part under discussion even before the part is completely designed.

Many designing engineers are well versed in foundry and pattern making practice and may feel perfectly competent to cope with the foundry problems without a discussion with the man who is to produce the castings. No two men even though well versed in a given subject have had identical experience. Frequently the combination of two types of experience results in real progress. Consequently, the engineer well versed in the foundry and who has had a vast amount of experience therein still will find it to his advantage to discuss his designing problems with the foundryman who may make the castings and thus benefit by the additional value of the different experience the foundryman may have had.

Another factor becoming increasingly interesting from the standpoint of design is the choice of material for a given part. Shall it be a forging, a casting, a die casting, a permanent mold casting, a part welded from several stampings, or a stamping from sheet metal? These problems face the designing engineer daily. Frequently a welded part, or a forging, or the like, is chosen when a casting would serve the purpose very much better, and would be even more economical had full co-operation existed between the designer, the foundryman, metallurgist and the patternmaker. Some surprising economies may be realized through this type of co-operation and economies frequently will result in the choice from this standpoint of the casting as compared with the other types of structural parts.

Crystal Structure Is Different

Cast materials if properly made, have a definite crystal structure, that perform definite duties. Welded or forged parts necessarily must have definite types of structure, since the exposure to heat in the forging process, or the rolling of material, preparation for stamping and later welding, develop a very different crystal structure from that in castings. Castings, due to their peculiar crystal structure have very definite characteristics to be preferred over the other materials outlined for certain types of service. If these castings have been designed to cast well, and the foundryman has had an opportunity to plan both the design and the pattern equipment to make sure of definitely sound, satisfactory castings, these castings almost invariably will give the highest degree of satisfaction where the crystal structure of castings is to be preferred.

Considering the problems entailed in the production of castings in the foundry, defects may be ascribed roughly to ten definite causes, outlined somewhat as follows: Pattern equipment, molding equipment, mold setting, gating, molding, molding sand, cores, metal, melting, pouring. To these might be added a miscellaneous group of minor reasons for defects.

Let us consider each of these in turn, bearing in mind that two or more may (*Please turn to page* 110)

A. F. A. PLANS CHICAGO CONVENTION AND EXHIBITION

FIRST official announcement of plans for the 1940 foundry and allied industries show, to be held at the International Amphitheater, Chicago, May 4, 6, 7, 8, 9, 10, 1940, in conjunction with the forty-fourth annual convention of the American Foundrymen's association, recently was mailed to exhibitors. Further indication of progress in preparing for the Chicago convention and exhibition is found in preliminary work already done by the technical staff and committees on the convention program.

Large Space Available for Exhibition

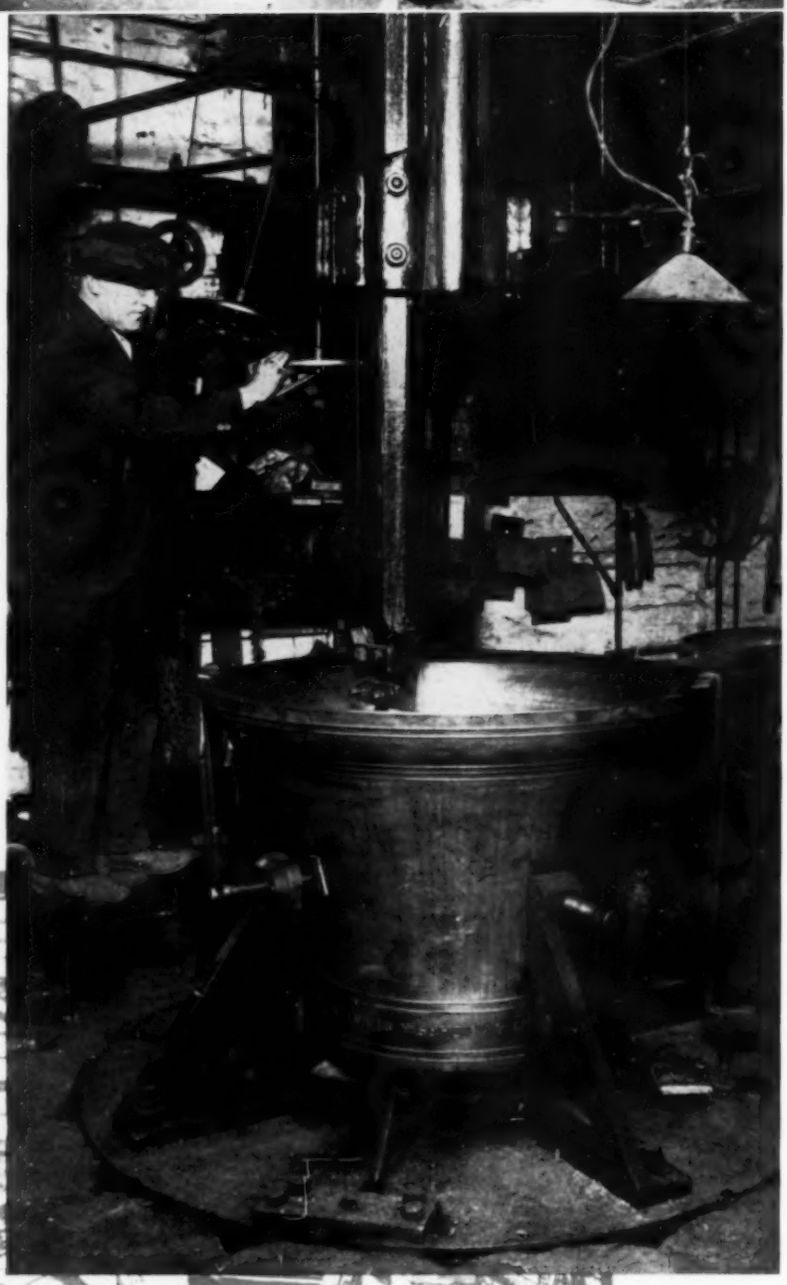
The large International Amphitheater located in the Union Stock yards, three miles from the loop, offers exceptional facilities for a large operating display of foundry equipment and supplies. The amphitheater has available 25,500 square feet of space and all modern facilities for handling the various needs of operating exhibits. The foundry show will open on Saturday, May 4, will be closed on Sunday, May 5, and will reopen on Monday, May 6 to extend through Friday, May 10. The plan of having a preview on Saturday afternoon and evening under the auspices of the Chicago Chapter of the A. F. A., offers opportunity for many operating foundrymen of the district to visit the exhibit when their plants will not be in operation. This plan of a chapter day was inaugurated in Cleveland in 1938 and proved most successful. Chicago, with the largest number of foundries of any American city, should break the previous attendance record on chapter day.

All technical and business meetings of the forty-fourth annual convention will be held in the amphitheater, the Stock Yards inn, and the Saddle and Sirloin club, where ample facilities are available. The plan of having all the activities in one central location is of definite advantage to both exhibitors and convention visitors. Thirty-four sessions have been scheduled tentatively covering discussions on shop practices and technical developments in gray iron, steel, malleable and nonferrous founding. Conferences of special interest to executives will feature foundry cost methods, job evaluation, training foremen and apprentices, and safety and hygiene. Special technical subjects to be covered include refractories, sand research, and pattern production.

Committees in charge have decided to continue two shop courses during the convention, each consisting of four sessions. One will deal with fundamentals of cast iron melting and the second with principles and practices of shop sand control. Plans are being developed for the annual meeting of instructors of engineering schools. This continues the series of meetings originated some 15 years ago for the purpose of bringing together those connected with the teaching of foundry practice in engineering colleges, and trade and vocational schools. This annual dinner meeting has enabled the association to become better acquainted with problems of instructors of foundry practice, and undoubtedly has provided a much greater degree of cooperation by the educational institutions and the A. F. A.

Plan for Extensive Social Activities

The nonferrous division is planning on holding its second annual social dinner following the most successful event held at the Cincinnati convention in 1939. The nonferrous division as well as the steel, gray iron, and malleable, will hold round table luncheons where important current problems will be presented for discussion and review. One of the high spots of the week will be the annual dinner of the association at the Palmer House ballroom, and the annual board of awards lecture at the business meeting of the association.



ENGLISH F

By J. S. TREVOR

SITUATED in the present densely populated section of East London, the Whitechapel Bell Foundry, an ancient weather beaten single story building is entirely out of harmony and sympathy with the surroundings. That is a feature of minor importance to the firm of Mears & Stainbank, Ltd., which through successive generations has melted metal and made castings on the same location for a period of nearly 400 years. Claim advanced that this is the oldest bell foundry in the world, may be open to question in view of the dates and other types of evidence found on certain Japanese and Chinese bells. Laying aside the world claim for the moment the authenticated records showing that the business was established in 1570, would seem to indicate priority in Great Britain, if not in Europe.

In the early days the foundry did not concentrate entirely on bells. Apparently the skilled artificiers were prepared to turn out castings for any type of customer, bells for the ecclesiastical establishments pointing the way to the future and better life, and guns for the bold sea rovers who specialized in sending as many of the enemy—any enemy—into

Fig. 1 (Above)—Metal melted in a reverberatory furnace is tapped into a ladle, and poured into a runner basin. Fig. 2 (Left)—Modern tuning machine is an important feature of bell founding. Fig. 3 (Right)—Putting finishing touches on core or inside part of mold

FIRM *Casts Bells* FOR 369 YEARS

this future state as soon and in as many pieces as possible. During the stormy reign of Elizabeth the firm did a handsome business fitting out ships with bronze cannon. Drake had them on board when he engaged the Spanish armada, an engagement which ended in a rout when a storm drove the tall ships flying like a herd of frightened stags to be smashed into kindling wood on the coasts of Ireland and Scotland. The same guns roared out a salvo of respect many years later when the body of the hardy adventurer was committed to the deep off Porto Bello, a town he had sacked and burned in a previous expedition 24 years before.

With the rise of cast iron and later of steel as a cannon material, the demand for bronze guns tapered off and eventually disappeared. The firm entered more extensively into the manufacture of bells. Originally the building was surrounded by green fields and a few scattered half timbered houses inhabited by city merchants and clerks who no doubt eyed the place with ill concealed resentment and hostility as a blot on the landscape. The green fields are gone. The merchants and the clerks are gone. The trim houses and the pleasant estates have disappeared. In the gradual evolutionary period of a great city the section north of the river and east of the Tower bridge has deteriorated into a slum area, but the Whitechapel foundry still is turning out bells at the old stand.

This old firm has cast most of the famous cathedral peals in Great Britain besides many historical and important church bells for foreign countries. The great bell of Westminster familiarly known as Big Ben, 13½ tons, held the weight record for many years until surpassed by the 14½-ton bell for the new Liverpool Cathedral. (*Please turn to page* 98)

QUESTIONS AND ANSWERS

Core of Auto Piston Is Not Vented Sufficiently

We are forwarding two halves of two different auto pistons molded in green sand under the same conditions. One has a scab and the other has a blow in the same spot adjoining a rib under the head. Facing sand shows permeability 82, green compression strength 8 pounds and moisture 4.3 per cent. Four pistons are molded in a flask with the sand in the cope 2 inches above the pattern. Inside of the casting is made on a rollover machine, with the sand tucked by hand and butted off when drag is filled. The cope is made on a jolt machine. Members of the staff are divided in opinion on the cause of the defect. One group maintains that the shallow cope does not provide sufficient pressure. The second group holds that the defect is caused by a hard surface under the head which traps a certain amount of the gas which does not escape through the drag.

We are inclined to favor the views of the second group. Although differing somewhat in appearance, the defects in the two castings arise from the same cause, steam or gas escaping through the top of the green sand core instead of flowing quietly downward and out through the bottom of the drag. In one instance the small amount of escaping steam sloughed a film of sand from one point at the top of the core. In the second instance a greater amount of steam caused the metal to jump and bubble for a brief period as shown by the solid pellet of metal bedded in the cavity. The cause of the defect may be traced to one, or possibly to a combination of several factors.

Owing to the shape of the casting, the number in a mold and the position of the sprue, the sand in the core is exposed to greater hazard than it would be in a body of different shape and size. Therefore, the usual technique must be modified to some extent. In the first place the operators probably are packing the sand harder than necessary. At the top of the core where the pressure of the metal practically is nil, soft sand will hold its shape. In the second place although the permeability is reasonably high, the core should be vented, preferably with four wires, one on each side of the wrist pin boss. The wires approximately ¼-inch in diameter may be attached to a cross and suspended from a spring above the machine. When the drag is scraped off the device is pulled down and the wires are driven into the sand. Then the device is released. In a general way the procedure is similar to that employed in chalking a billiard or pool cue. Finally, provision should be made under the drag for the ready escape of steam and gas from the vent holes. Obviously their purpose is defeated if a board is rubbed down on the drag or if the drag is placed on a close sand bed.

Gives Metal Composition, Sand Data for Motor Castings

Can you give us a suitable mixture as well as the proper analysis for automotive cylinder blocks and manifolds, advising if the same mixture is suitable for both. Also, can you give us any information on the grade of sand most suited to that class of work?

A wide range of compositions are employed for automotive cylinder blocks and the usual limits for the various elements fall within the following ranges: Silicon, 1.80 to 2.35 per cent; manganese, 0.35 to 0.95 per cent; phosphorus, 0.30 per cent maximum; nickel, 0.20 to 0.85 per cent or molybdenum 0.20 to 0.55 per cent, and chromium, 0.20 to 0.40 per cent. Exhaust manifolds can be made of the same composition except that the nickel or molybdenum and the chromium should be in the higher ranges. In some cases manifolds are made of a composition containing 13 to 15 per cent nickel, 5 to 7 per cent copper, and 1.50 to 2.50 per cent chromium.

Without knowing just what raw materials you have available, it is difficult to give a definite mixture except to say that most of that work is made from metal in which from 15 to 25 per cent steel scrap is part of the raw material. From that and the analyses given, it should not be difficult for you to determine the proper amount of pig iron, return scrap, and foreign scrap.

One leading automotive manufacturer makes cylin-

der blocks in a backing sand with a green strength of 2.0 to 2.2 pounds per square inch, a permeability from 65 to 80, a moisture content from 5.0 to 5.4 per cent, and a sea coal content from 9.0 to 10.5 per cent. The facing sand is similar except that the strength ranges from 2.2 to 2.4 pounds per square inch, and the sea coal from 11.0 to 12.5 per cent. The grain size is about 70.

Metal Leaking Out After Mold Was Filled Leaves Cavity

We are forwarding a small white iron casting approximately 4 x 5 inches and ¾-inch thick. The surface of the casting is perfect, but a cavity appears near the center of one side. Can you explain the cause?

The cavity was caused by metal which leaked out after the mold was filled. The metal had started to solidify before the leak occurred, hence the outside retains its shape. As to how or why the metal found a passage we have no means of determining. The most probable cause is a weak jacket or a thin wall of sand which could not resist the pressure.

Cold Metal Cause of Rat Tails On Bath Tub Castings

We shall appreciate an explanation of what is meant by the term *rat tails*, a certain form of defect on the surface of castings. How are they caused and how can we prevent them. We produce castings to be enameled, lavatories, sinks and bath tubs. We have trouble, particularly with the bath tubs. We find narrow and deep depressions in the iron running in several directions, some short and some long. Naturally these depressions interfere with the production of a smooth, uniform, enameled surface.

The term *rat tails* in the proper and original sense is applied to shallow channels or streaks on the face of a casting from a fancied resemblance to the indentation that would be left if a rat were to walk across a plastic surface dragging his tail behind him. Several theories have been advanced to account for that form of defect. One is that where the sand is damper than usual a small globule of moisture or a jet of steam is caught between the sand face and the flowing stream of metal. The globule or jet slightly chills the film of metal in the immediate vicinity and continues that effect for a shorter or longer distance until the weight of the metal is sufficient to drive the remaining steam into the sand.

To a certain extent and for purpose of illustration and comparison, the general effect is the same as would be found if a layer of plastic material was dragged over a similar layer of material presenting a small, hard projecting member. The hard object in the lower layer would form a channel in the lower face of the upper piece of material. However, as with many other foundry terms, laxity has crept in, and the term rat tail now is applied loosely to any narrow indentation on the face of the casting. In your particular case we are inclined to the opinion that the defects are incipient cold shuts and not rat tails. Molten metal develops a film on the surface and naturally the film increases in strength, thickness and viscosity as the temperature decreases. The drop in temperature is rapid in thin castings, and in addition the fluidity of various irons is not the same at comparable temperatures.

The film temporarily halts advance of the metal over the sand surface. When the force of metal bursts through the metal film and continues on its course, a small part of the film remains in solid form a hurdle over which the iron stream flows. The first iron of the overflow does not knit properly with this existing solid iron and the result is a wrinkle which may be long or short, depending on many factors. This phenomenon in intensified form may be noted where iron is poured against a cold chill. Where the molten iron is kept in rapid motion, wrinkles do not appear on the resulting casting. Where the molten iron moves slowly, or halts temporarily, wrinkles appear without fail. In some cases the indentations in the face of the casting are caused by a sand which buckles through expansion and throws up ridges which are reproduced in reverse on the face of the casting.

Briefly your problem resolves itself into providing a permeable sand with minimum moisture and bond content, and in pouring the castings as rapidly as possible with an iron which retains fluidity at comparatively low pouring temperature. A noted authority in the enameling field recommends the following analysis: Carbon 3.40 to 3.50 per cent, silicon 2.40 per cent, manganese 0.75 to 0.85 per cent, phosphorus 0.70 to 0.75 per cent, sulphur 0.065 to 0.075 per cent. A paper "Hints on Molding and Preparation of Castings for Enameling," by R. B. Schaal, appears in the *Transactions* of the AFA., vol. XLVI.

Requests Data on Roll Castings To Be Made in Chill Molds

We have a chilled roll to cast 28 inches inside diameter, 36 inches outside diameter and 36 inches in length. The chill for the outside of the mold is to be in one piece and to be machined on the inside. Depth of chill on the face of the roll is not a factor in this instance. We shall appreciate your opinion on the proper thickness of the chill casting wall, a composition that will not crack when the casting is poured, and a chill that will not warp out of shape when it is heated.

Usually in cases of this kind the depth of chill in the anticipated casting is one of the principal factors to be considered. Thickness of the chill ring has a direct relationship in this respect. Composition of the iron in the roll is another factor that has to synchronize in proper order with the temperature, speed of pouring and chill thickness.

All you need is a cast iron container similar to the familiar ingot mold in which steel is poured. An approximate thickness of 4 inches will serve your purpose. Composition of the iron is more important than the thickness. Hard iron will crack when heated suddenly. Use a good, soft iron for the chill, preferably a bessemer iron. While pouring the roll, fill the mold rapidly so that expansion will be distributed in a fairly uniform manner. A truly round chill with uniform thickness of metal will not warp or become distorted in use.

Causes Pinholes in Steel Castings

We are having trouble with pinholes in the steel casting. The bushings 5 inches diameter outside and 12 inches in length are molded on end, two in a flask. They are gated at the bottom and the riser on top extends half way around the casting. Steel is melted in an electric furnace and the molds are dried in the oven.

Unfortunately your sketch shows a casting completely machined with nothing to indicate which end was molded up, nothing to show where the pin holes appeared, nothing on which to base a definite opinion. For a long distance opinion based on a general background of experience we should be inclined to blame the core, large for the greater part of the distance and constricted at the upper and lower necks. The metal does not lie quietly against this core, but kicks and boils. Most of the gas escapes, but a certain amount remains trapped in the metal to form blow holes. Later when the casting is machined these cavities are uncovered.

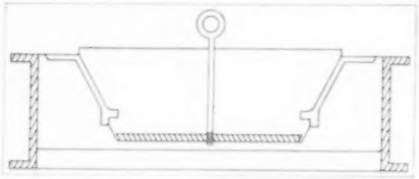
Presumably the mold is thoroughly dried and you have no reason to suspect dampness. Pin holes may be traced to different causes, the mold, the core or the metal and you probably will have to employ a process of elimination to discover the direct cause in this instance. We suggest you start first by using a core bonded with a minimum amount of binder and vented freely in excess of the usual requirements. Add sawdust to the core sand mixture, or place a handful of small coke in the center. Run a ¼-inch rod through the core for a vent passage and provide a clear exit through the mold for the gas to escape.

To Cast Manholes Without a Cope

We are enclosing sketch of a manhole frame casting and will appreciate your advice on how these castings usually are molded. In this instance the castings will be acceptable if poured flange up in open sand. If a cope is not used how is the center core taken care of? Which is preferable, to bed the pattern in or roll the drag over? Can a jolt ram machine be used on this job without constructing special patterns?

Several methods are available for molding manhole frame castings. The best method depends on several factors, including the rigging now on hand and the number of castings on order. The minimum amount of rigging is required where the pattern is bedded in the floor and the inside body of sand lifted out on a circular plate. However, this method is comparatively slow and the work can be entrusted only to a fairly well skilled molder. Assuming that you have a jolt ram machine and that the number of castings warrants the construction of more or less rigging, the castings can be turned out rapidly by unskilled or semiskilled operators.

The pattern, either wood or metal, is provided with a circular core print 1½ or 2 inches deep. The drag flask has a set of shallow bars across the bottom which serve instead of a bottom board or plate. Other equipment includes a split,



Core is made in a hinged, split corebox and lifted on a circular plate equipped with either three lifting loops or a single lifter in the center

hinged corebox and any required number of circular lifting plates. Preliminary work includes the laying down of a pair of rails, parallel and level to serve as a permanent setting up floor. In actual operation the drag is jolted on the machine, lifted off, rolled over and placed on the rails. The operation is repeated until the required number of molds for the day is put up. If metal is poured continuously, of course the molds are poured, removed and shaken out periodically to make room for others. If the output warrants the use of two machines, the drags are made on one and the cores are made on the other and the molds are assembled immediately.

Under another combination the drags are jolted on the machine, while the cores are rammed by hand. Under a third method all the drags are made first and set up on the rails. Then the corebox is mounted on the same machine and the cores are made up. The lifting plate for each core, ¾ to 1-inch thick is provided with a lifter in the center. The lower end of the lifter is screwed into the plate and the upper end which projects above the core is formed into an eye for attaching to the hoist. The plate is tapered to fit approximately into the tapered print in the corebox. Since the thickness of the plate does not equal the depth of the print, a sand seal is secured when the core is lowered into place in the mold. On a straight wall casting, the metal will not disturb the core. In the present instance, with a flared wall, it may be necessary to rest a weight on the lifting bolt, or lay a flat bar on top and clamp it to the flask flange. Experiment with one or two castings readily can determine whether anchorage of the core is necessary or not. It is advisable to make a core about 1-inch higher than the mold to prevent metal running over the top. Metal can be poured directly into the top of the mold through a runner cup resting on rods, bars, a flat plate or any other form of support.

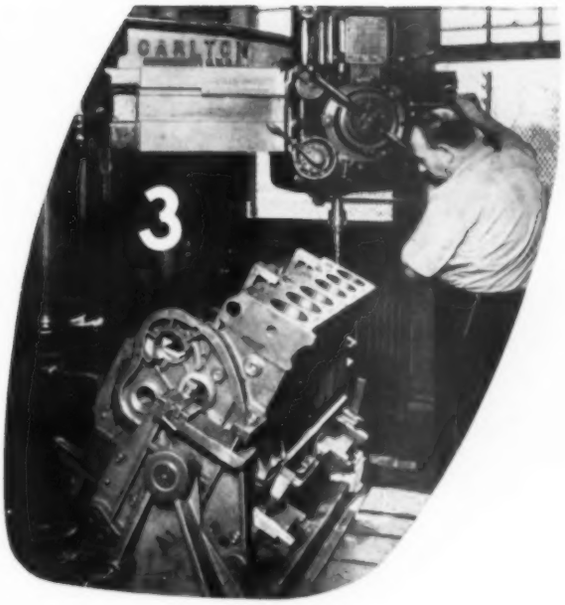
Iron Firepot Leaks Under Pressure

A cored firepot, walls approximately ¼-inch thick, for a water heating stove leaks under a water pressure test of 120 pounds. We have no recent determination of the carbon content of the iron, but the other elements show as follows: Silicon 2.27 per cent, sulphur 2.87 per cent, phosphorus 0.89 per cent, manganese 0.55 per cent. To prevent porosity in the iron we have added steel punchings in the ladle and have been considering the use of ferrochrome for the same purpose.

With the exception of the sulphur content, 2.87 per cent—evidently a typographical error — the analysis is fairly typical of the iron employed in all foundries for comparatively light castings. Practically any iron with a silicon content ranging from 2.00 to 3.00 per cent in light sections will produce a casting sufficiently dense to resist a 120-pound per square inch water test. Porosity in the firepot is caused by some other factor in the sequence of production. General experience would lead an investigator to examine the core.

In this particular casting the core is entirely surrounded with metal except one or two small openings. Obviously a large volume of gas is generated. Obviously also if this gas cannot escape readily and rapidly through suitable vent openings, some of it will try to force itself through the metal in the casting wall. A certain amount will escape in this manner, but a sufficient amount will be trapped in the rapidly freezing metal to produce either a porous structure, or a number of distinct cavities either singly or in series. Suggested remedy is to make a core with a minimum amount of binder, bake it thoroughly, provide adequate vent passages in the core and—what is just as important—provide a passage from the end of the core print to the atmosphere so that the gas can escape immediately.

3 STEPS IN THE PRODUCTION OF BETTER CASTINGS



Step into the Mack Manufacturing Corporation's foundry at New Brunswick, N. J. where castings that need no coddling may be seen. For instance, cylinder blocks for heavy duty trucks are being made better—by adding Nickel to every melt.

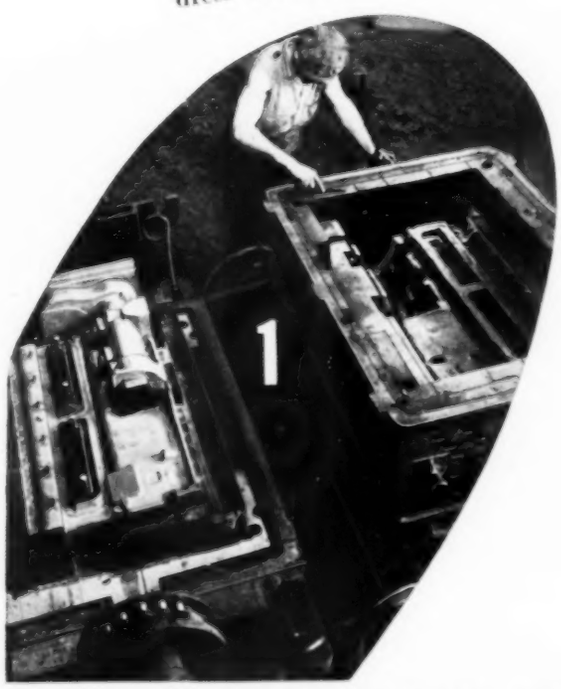
1 Accurate molds, skin hardened by a flame treatment, reduce amount of machining. Nickel assures uniformity, induces density throughout casting of intricate designs.

2 Accurate cupola control is a long step toward increased foundry profits. It also pays to determine the right composition for the work to be done by your castings. By using Nickel alone or with other alloys you can refine grain, elevate strength, and increase wear resistance. Mack checks temperatures carefully with this optical pyrometer—even though Nickel broadens the casting range of ferrous metals.

3 Accurate control of machining costs begins in the foundry. Mack radially drills this heavy duty cylinder block made of Nickel cast iron at speeds *1½ times faster* than that possible with other cast irons of similar hardness.

For helpful information on how to improve your castings and increase your cash profits, please address International Nickel's casting service staff.

NICKEL
CAST IRONS



THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

MEN of INDUSTRY

HERMAN E. ALEX, general foreman of the foundry and pattern shop, Rock Island Arsenal, Rock Island, Ill., was elected chairman of the Quad-City Chapter of the A.F.A. Mr. Alex has been connected with the foundry industry since his graduation from public schools. He served his apprenticeship as a molder at the Davenport Foundry & Machine Co., Davenport, Iowa, from 1889 to 1892. On Sept. 15, 1892 he was hired as a molder at Rock Island Arsenal and was made general foreman of the arsenal program in 1911. Mr. Alex always has been interested in local foundry association work and in the work of the A.F.A. He was a charter member of the Quad-City Foundrymen's association which later became the Quad-City chapter.

• • •

JAMES P. GILL, chief metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa., succeeded William P. Woodside, vice president in charge of research, Climax Molybdenum Co., Detroit, as president of the American Society for Metals at its convention in Chicago recently. Other officers elected are: DR. OSCAR E. HARDER, assistant director, Battelle Memorial institute, Columbus, O., vice president; DR. KENT R. VAN HORN, research metallurgist, Aluminum Co. of America, treasurer.

• • •

WALTER L. SEELBACH, secretary and treasurer, Forest City Foundries Co., Cleveland, has been elected chairman of House Heating and Air Conditioning division of the Association of Gas Appliances and Equipment Manufacturers, New York. As division chairman, Mr. Seelbach automatically becomes a director of the A. G. A. E. M.

• • •

HAROLD J. STEIN, research engineer of the manufacturing department, Allis-Chalmers Mfg. Co., Milwaukee, has been appointed director of research, chemistry, and metallurgy, thus bringing all three activities under one head. His assistant will be J. T. JARMAN. W. A. HAMBLEY has been made metallurgist in the gray iron foundry and ARTHUR K. HIGGINS, metallurgist of the nonferrous foundry.

Mr. Stein became connected with Allis-Chalmers as a graduate student apprentice in 1916 and during his period of training served in the various manufacturing departments including detail, erection and test. Working in the forging department he was later made foreman of the tractor heat treating department and then general foreman of all the company's heat treating operations. He was next advanced to assistant superintendent of the forge department and later to assistant research engineer of the manufacturing department. In 1936 he was made chief research engineer of all the manufacturing departments of the Allis-Chalmers Co.

• • •

JOHN M. LUTZ has become associated with the Chicago sales division, Continental Roll & Steel Foundry Co., East Chicago, Ind.

• • •

A. C. ARBOGAST, vice president, Northern Indiana Brass Co., Elkhart, Ind., recently was elected chairman of the Michiana Chapter of the A. F. A. Mr. Arbogast served his apprenticeship from 1916 to 1920 and entered the employ of the

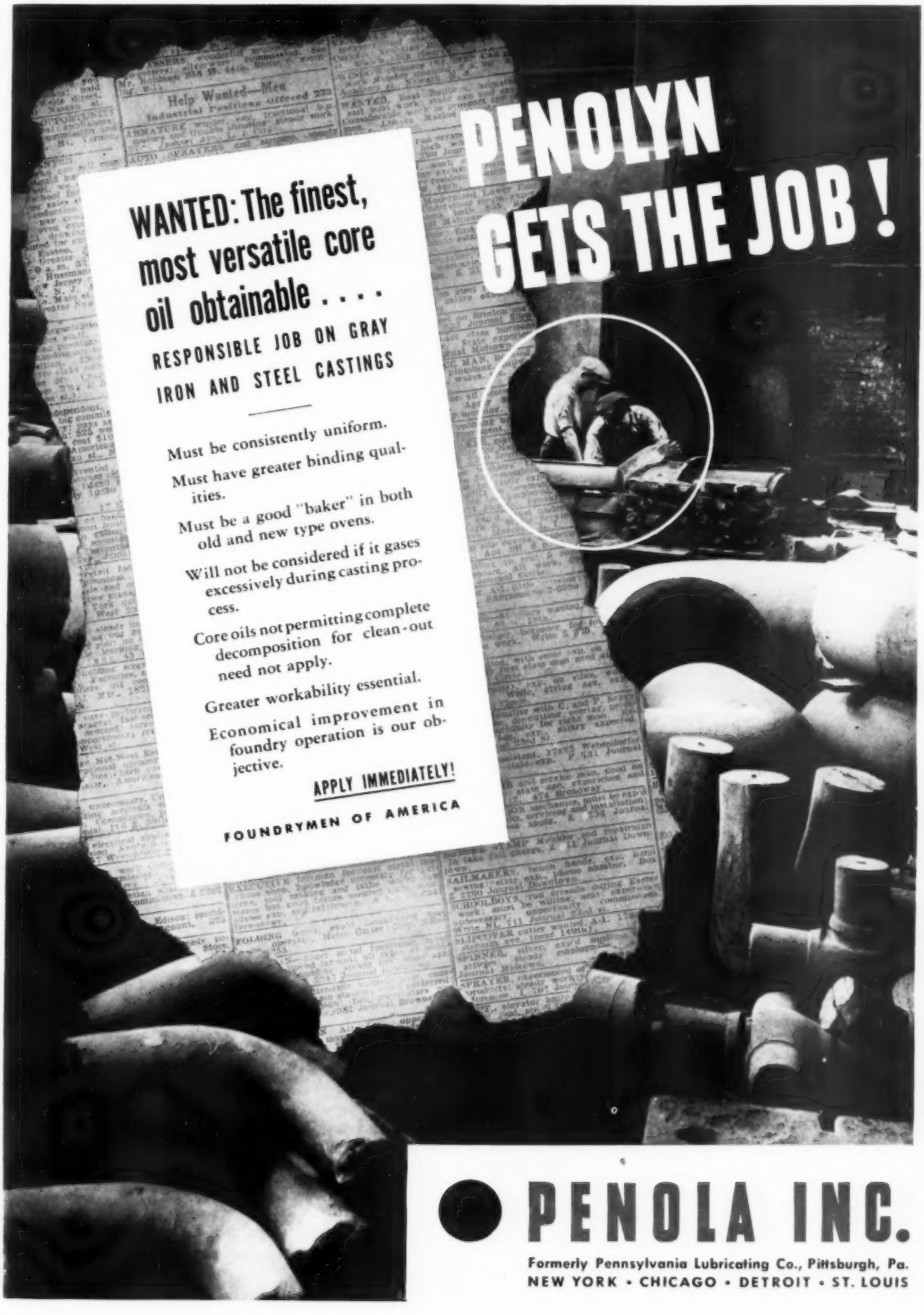
(*Concluded on page* 42)

James P. Gill

Walter L. Seelbach

Harold J. Stein

Herman E. Alex


PENOLYN
GETS THE JOB!
WANTED: The finest, most versatile core oil obtainable . . . .
RESPONSIBLE JOB ON GRAY IRON AND STEEL CASTINGS
Must be consistently uniform.
Must have greater binding qualities.
Must be a good "baker" in both old and new type ovens.
Will not be considered if it gases excessively during casting process.
Core oils not permitting complete decomposition for clean-out need not apply.
Greater workability essential.
Economical improvement in foundry operation is our objective.
APPLY IMMEDIATELY!
FOUNDRYMEN OF AMERICA

PENOLA INC.

Formerly Pennsylvania Lubricating Co., Pittsburgh, Pa.
NEW YORK • CHICAGO • DETROIT • ST. LOUIS

(*Concluded from page* 40)

Northern Indiana Brass Co. in 1923 as factory foreman. In 1926 he was given the position of factory superintendent in charge of plant operations which include foundry and machine departments.

• • •

FRANK H. ADAMS, vice president and general manager, Surface Combustion Corp., Toledo, O., has been elected president, Association of Gas Appliance and Equipment Manufacturers.

• • •

EDWARD MACK JR., former head of the department of chemistry, University of North Carolina, has been added to the supervisory staff of Battelle Memorial institute, Columbus, O.

• • •

JOHN SLEZAK, Turner Brass Works, Sycamore, Ill., has been nominated as one of 24 candidates from Illinois to serve on the board of directors of the Illinois chamber of commerce.

• • •

A. J. MCDONALD, formerly vice president in charge of sales for the Lebanon Steel Foundry, Lebanon, Pa., has become connected with the American Steel Castings Co., Newark, N. J., in a similar capacity.

• • •

LEWIS H. BROWN, president, Johns-Manville Corp., New York, recently was awarded the Vermilye medal of Franklin institute, Philadelphia, in recognition of outstanding contributions in the field of industrial management.

• • •

C. L. PETERSON has been named advertising manager, Cleveland Crane & Engineering Co., Wickliffe, O., succeeding the late John R. Booher. Mr. Peterson has been with the company 3½ years following service with several electrical equipment firms.

• • •

CHESTER W. RUTH, formerly assistant director of advertising, Republic Steel Corp., Cleveland, has been appointed director of advertising, succeeding Stanley A. Knisely, who recently resigned to become executive vice president, Associated Business Papers, New York.

• • •

D. B. MCCOY, manager, Toronto, Ont., office of Steel Co. of Canada Ltd., since 1922, has been appointed sales manager with headquarters in Hamilton, Ont. Mr. McCoy began his career in the steel industry in 1907 when he joined the Belleville Rolling Mills. When that company was absorbed by Steel Co. of Canada in 1910, he took over the northern Ontario and Ottawa valley territory. In 1919 he was placed in charge of the Vancouver sales office. Mr. McCoy was active on the Toronto committee for the 1935 annual convention of the A. F. A. in that city. CHARLES S. PHOENIX, salesman in the Toronto office in 1922, in charge of the pig iron division, succeeds Mr. McCoy as manager.

• • •

S. M. TIFFIN has been appointed manager of the St. Louis division, Federated Metals division, American Smelting & Refining Co., succeeding David Nassau, resigned. ARTHUR FRITSCHLE has been appointed executive sales manager of the St. Louis branch.

• • •

EDWARD J. GREENE has been made assistant treasurer of the Chain Belt Co., Milwaukee. Mr. Greene formerly was assistant treasurer and purchasing agent of the Baldwin-Duckworth Chain Corp., Springfield, Mass., which was recently merged with the Chain Belt Co.

• • •

WILLARD A. STEIGER recently has become associated with the Urick Foundry Co., Erie, Pa., as sales representative in Central and Eastern Pennsylvania and New York state, with office at 815 Lancaster avenue, Syracuse, N. Y. Mr. Steiger formerly was with Brown-Lype-Chapin Co., Syracuse.

• • •

CHARLES E. MCLEAN, a foundryman of the firm of McLean & Scorrer, Sydney, Australia, and Mrs. McLean, recently visited the United States. Before sailing on the S. S. MARIPOSA on Oct. 14, they were entertained by San Francisco foundrymen, and taken for a visit to the Golden Gate International exposition.

• • •

ARTHUR W. ALLEN, for many years, general manager, San Francisco Stove Works, San Francisco, has resigned to enter the foundry business as a partner with D. KAZANJIAN. A location has been purchased in a new industrial area of San Francisco and a new steel building will be built as the home of the Lincoln Iron Foundry.

• • •

Honorary membership in the American Society for Metals recently was conferred on DR. ZAY JEFFRIES, technical director, incandescent lamp division, General Electric Co., Nela Park, Cleveland. Founder membership in the society was conferred on COL. A. E. WHITE, director, department of engineering research, University of Michigan, Ann Arbor, Mich.

• • •

RICHARD L. GROSSE, formerly of the staff of the American Foundrymen's association, Chicago, recently became connected with the General Malleable Corp., Waukesha, Wis., as supervisor of the cupola and pouring crews. Mr. Grosse graduated from Marquette university in June, 1938 with the degree of bachelor of chemical engineering. While attending the university he spent some of his time working for the General Malleable Corp. in the cleaning room, pattern storage, pattern shop, core room, aluminum department, pouring crew and the foundry.

Book Review

Engineering Physical Metallurgy, by Robert H. Heyer, cloth, 549 pages, 6 x 9 inches, published by D. Van Nostrand Co. Inc., New York, and supplied by THE FOUNDRY, Cleveland, for $4.50.

This volume is designed to aid those making their first acquaintance with engineering metals and alloys. As the author points out, information of a high order is available, but few attempts have been made to condense, correlate, and to bring up to date various materials, methods, and concepts of metals technology. The author has endeavored, and in our opinion successfully, to produce a simple treatment of that field, and to adapt it to the instruction of nonmetallurgical students. Although a wide range of materials within the major divisions of physical metallurgy has been included, the author has not attempted to approach the completeness of a handbook, or to offer a laboratory manual.

The book is divided into 15 chapters dealing with the following subjects: Pure metals, principles of alloying, white metals and their bearing alloys; light alloys, die castings, copper and its alloys, iron and carbon steels, heat treatment of steel, low and medium alloy steels, surface treatment of steel, steel castings, welding, cast iron, high alloy steels, tool steels. In addition the book contains an appendix, and appropriate index.

James D. Cunningham, chairman of the board of trustees, Armour Institute of Technology, and Alexander D. Bailey, chairman of the board, Lewis institute, announced recently that their respective institutions have entered into an agreement to consolidate into a new technological center for Chicago. The name of the new school is to be Illinois Institute of Technology with the two component colleges recognized by maintaining their names as applied to the two divisions. The consolidation of the educational program will be complete by September, 1940.

"KNOCKOUT" BOTTLENECK ELIMINATED

Knockout time cut 30%! That's how Truline Binder speeds up production in one gray iron foundry.

Removing cores from castings was a real production bottleneck. This familiar and costly delay is gone forever. The Truline mix cleans out in much less time than the old mix — because Truline burns out completely. The cores collapse as the metal shrinks. And that's not all!

Binder costs are exactly the same. Truline cores are equal in every other way to the previous mix

★ ★ ★ ★ ★

Truline Binder is doing a big job in many foundries — by giving identical core properties day after day, replacing more costly binders, promoting rapid baking and easy cleaning. And it often permits the re-use of sand, producing further savings. You should find out what Truline can do for you.

HOW TRULINE BINDER SAVES YOU MONEY

- Low initial cost.
- Pulverized to uniform fineness.
- Does not absorb moisture.
- Makes strong, permeable cores that will not sag.
- Cores collapse as metal shrinks.
- Burns out completely — reduces cleaning costs.
- Helps to eliminate cracks, especially in high-shrinkage castings.
- Permits easily controlled reproduction of core properties.

TRULINE BINDER CAN BE USED WHEREVER METALS ARE CAST

Reg. U. S. Pat. Off. by Hercules Powder Company.

Use this handy coupon

BRANCH OFFICES

Chicago
New York
St. Louis
Salt Lake City
San Francisco

HERCULES NAVAL STORES

HERCULES POWDER COMPANY
Incorporated
999 Market Street, Wilmington, Delaware

Please send further information and prices on Truline Binder.
Please send samples for test.

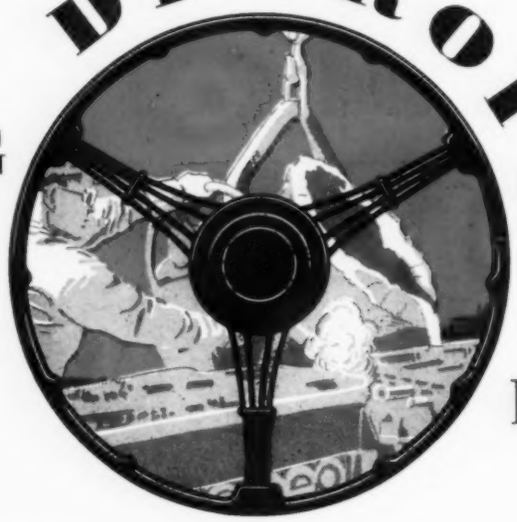
Name _____

Position _____

Company _____

Address _____ JJ-25

AMONG DETROIT FOUNDRIES



By A. H. ALLEN
Detroit Editor, The Foundry

THIRTY-FIVE miles from the industrial turmoil which has been Detroit's lot for the past 3 years, in the comparative peace and quiet of Monroe, Mich., is the compact little foundry of Monroe Steel Castings Co. which is thriving on supplying the automotive trade with various sizes and shapes of steel castings. Originally organized in 1912 and completely rebuilt in 1923, the company has been adding further to its equipment in the past 2 years until now it is making about the most efficient use possible of buildings not originally designed to encompass a modern steel foundry.

A central structure houses melting, molding, pouring and shakeout facilities. At one end is the scrap stockpile where incoming raw material is classified and stored, awaiting charging into the adjacent 3-ton electric furnace. Currently, heats are running about 8000 pounds and are prepared on approximately 1½-hour cycles. Basic metal cast is a steel running 0.25-0.35 carbon, 0.65-0.70 manganese, 0.30-0.40 silicon, with varying percentages of alloying elements added according to specifications of customers. All analyses are of the low-alloy type, additions usually calling for nickel, chromium, vanadium, molybdenum, etc., in amounts ranging up to 2 per cent on a general average.

A high-grade of low-phosphorus scrap is purchased, emanating from several of the large automotive parts fabricators in Detroit. It is small in size, including punchings, cut tubing and other light-gage material. Furnace charges average 35 per cent returns on foundry scrap, and the balance purchased scrap and alloys. By paying a premium for a high grade of scrap and carefully controlling the melting operation, a good grade of machinable cast steel is produced, with rejects running under 1 per cent. Overall yield of the foundry runs between 50 and 55 per cent, with rated capacity of 350 tons per month on the 40-hour week basis.

Fig. 1—Eighteen sand hoppers supplying jolt squeezer molding machines—completed molds moving down the pouring conveyors to the left

Metal Distributed Readily

Heats are tapped from the electric furnace into a large ladle which is transferred by overhead crane to a pouring car on a track running across the main bay at about its central point. This car, with trunnions to accommodate the ladle, is moved by electric truck, also riding on the cross track, and can be spotted next to smaller ladles in pouring devices which ride on overhead monorail systems and serve the waiting molds on roller conveyor lines at the far end of the bay. These conveyor lines are built about 12 inches off the floor and the molds can be moved off the ends onto a transfer car, hauled by the electric rail truck, and moved quickly to the floor-level shakeout which adjoins the cross track on the opposite side to the mold conveyors. The transfer car has two sections of roller conveyor which can be spotted next to the mold conveyor lines, permitting easy transfer of the poured

(*Continued on page* 46)

AGAIN A MODERN MATERIAL SAVES WEIGHT, SIMPLIFIES DESIGN

Around an oil derrick a cat line hoist that doesn't function when wanted is of mighty little use. But it is not so easy to combine the needed strength and service capacity with simplicity and lightness.

It is not easy. But it has been done—by the use of a modern material for the hoist housing, a Molybdenum (0.65% Mo.) iron. The strength and toughness of this iron safely permits light sections. And it also helps keep construction simple. The fine, close grained structure permits the machining, in the housing itself, of surfaces sufficiently smooth to serve as outer races for the drive and drum shaft roller bearings. Premature wear or Brinelling of these races is forestalled by the hardness of the iron.

A check-up of your own materials specifications may disclose similar opportunities for simplification and saving. You will find our free technical booklet, "Molybdenum in Cast Iron," helpful.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

(*Continued from page* 44)

molds to the car.

As the molds are shaken out on the vibrating grid, the sand falls through and onto a conveyor belt below. Castings are transferred to steel buckets, the smaller ones by hand and larger ones by an electric lifting device or lever. Electric trucks pick up the buckets and move them to the cleaning room where risers are cut off by oxy-acetylene torch, after which the castings are blasted and follow through the usual series of grinding and annealing operations.

Sand from the shakeout is moved by the underfloor conveyor to an elevator which carries it over a magnetic pulley where all ferrous particles are removed. The cleaned material is then elevated to two overhead storage bins. These bins, and a third smaller bin accommodating new sand, have hoppers opening over a sand muller which prepares mixes for the molding operations. An Ottawa sand is used, with a bentonite bond, and various mixes are employed, depending upon the casting to be made. Batches are mixed and discharged into steel buckets which are moved by electric truck to a distributing crane mounted over 18 large hoppers at the far end of the building. These hoppers are about 15 feet deep, with discharge spouts about 7 feet off the ground. Chutes under each spout direct sand to molding machines stationed under each hopper. This line of 18 jolt-type and squeezer-type machines supply molds for all of the smaller castings, and is designed to be flexible enough so that molding machines may be interchanged at will under the sand hoppers.

Molds made on this line are transferred to the roller conveyor lines previously mentioned and are moved up the line for pouring, thus calling for a minimum amount of handling between molding, pouring and shakeout operations. In fact, the entire plant layout has been designed for a minimum amount of manual handling operations, and where manual labor is required, usually some mechanical assistance is available.

Larger castings are molded on a sandslinger located between the electric furnace and the transfer track, an adjacent monorail system accommodating pouring devices for the larger ladles used in pouring these heavier castings. The foundry is equipped to pour castings up to 4000 pounds, but prefers to concentrate on smaller pieces where quantity production runs are possible. Typical of large castings are rear axle housings for trucks, fifth wheels for tractor-trailer units, road machinery castings and the like. Other parts produced are included in the category of brake shoes, spiders, spring brackets and hangers, shifting forks, sheaves, bulldozer castings, snowloader castings and such.

Patterns Are Purchased

Patterns are not made in the plant, except for a few small experimental units, others being purchased on the outside. General machining work also is done outside, although equipment is available for maintenance and repair work. Cores are made in the plant, a separate muller being operated on core sand, with three ovens available for baking—two rack type and one drawer-type. Heat is supplied from oil burners mounted on top of the ovens. Oil-fired annealing ovens are operated for tempering of all finished castings. Normal one-shift capacity of the plant involves a complement of 130 men.

Visitors entering the Monroe plant first meet the company's trademark in the person of Rex, a large cast iron dog standing guard at the entrance way. Rex was acquired some years ago by Carl F. Clarke, president, from in front of an old residence in Geneva, O. Mr.

(*Concluded on page* 49)

Fig. 2 (Above)—General view of main bay showing electric furnace and sandslinger in background with small mold lines in foreground. Fig. 3 (Left) — Transfer car on which bull ladle rides supplying steel to pouring devices. At rear of electric rail car is section of movable transfer conveyor across which poured molds are moved to the shakeout

Stamina and Accuracy on BIG MOULDS

Recent installations verify the superiority of Osborn design in the Large Rollover field. Among their major features are...

1. Compact assembly in one-piece cast frame.

2. Load handled and rolled over on approximate center of gravity in minimum space at maximum speed.

3. Draw parts are in position of greatest bearing area at start of draw operation, thereby assuring maximum accuracy.

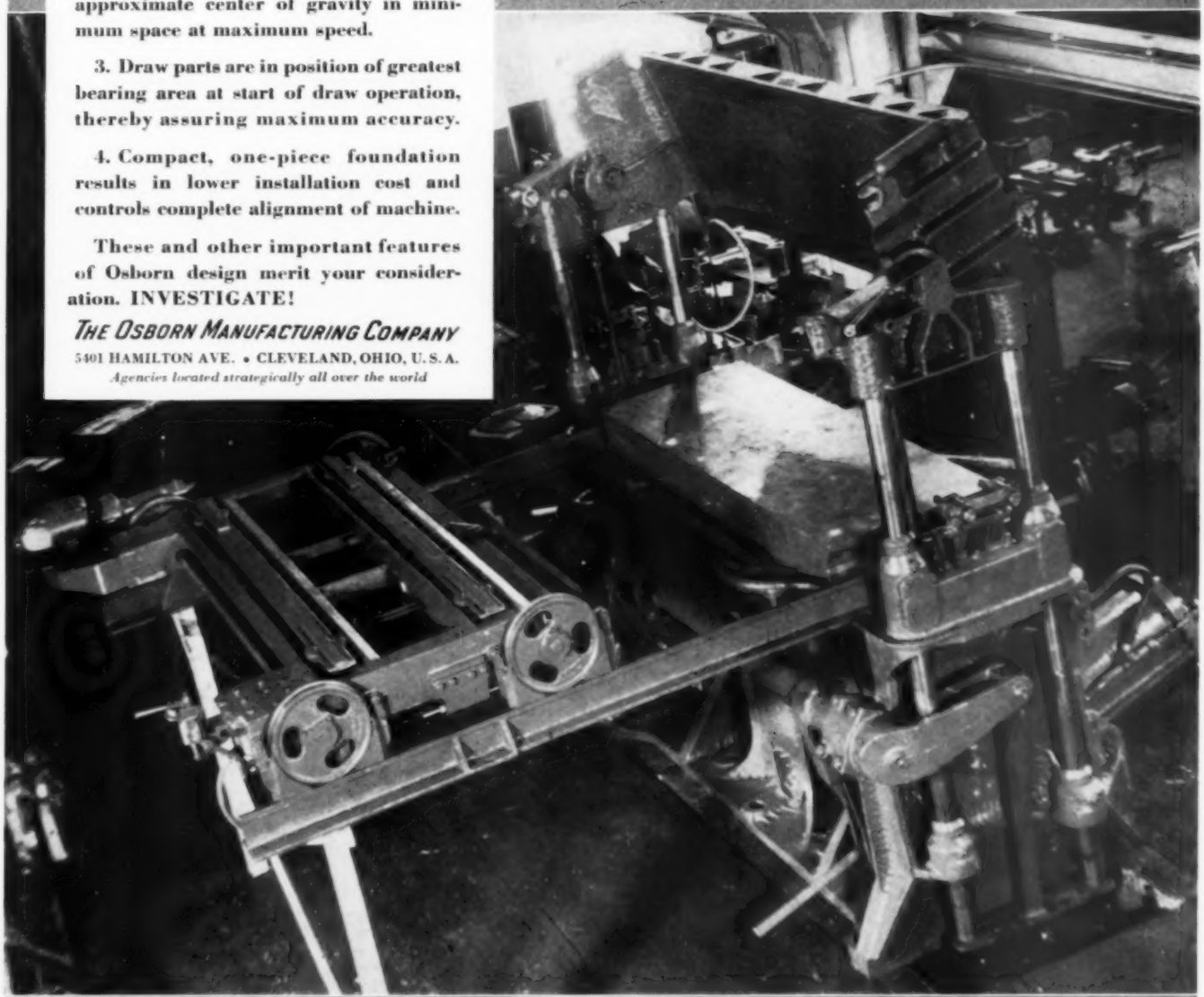
4. Compact, one-piece foundation results in lower installation cost and controls complete alignment of machine.

These and other important features of Osborn design merit your consideration. INVESTIGATE!

THE OSBORN MANUFACTURING COMPANY

5401 HAMILTON AVE. • CLEVELAND, OHIO, U. S. A.

Agencies located strategically all over the world

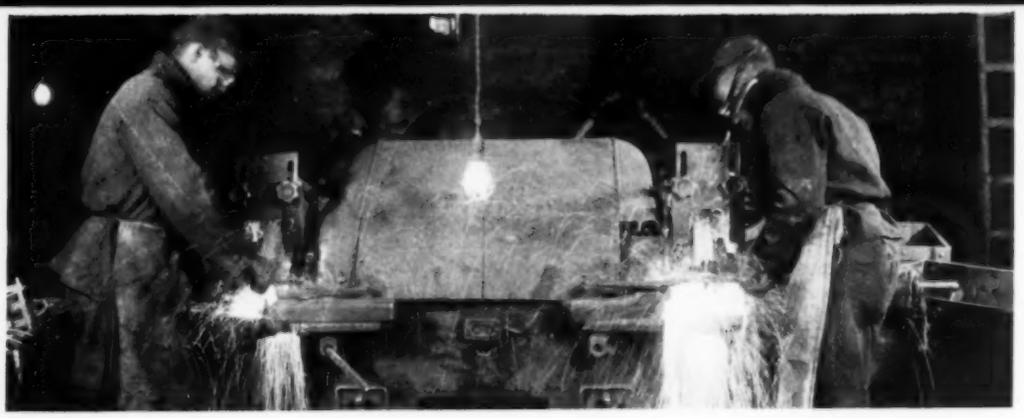


Time Proves Values

OSBORN

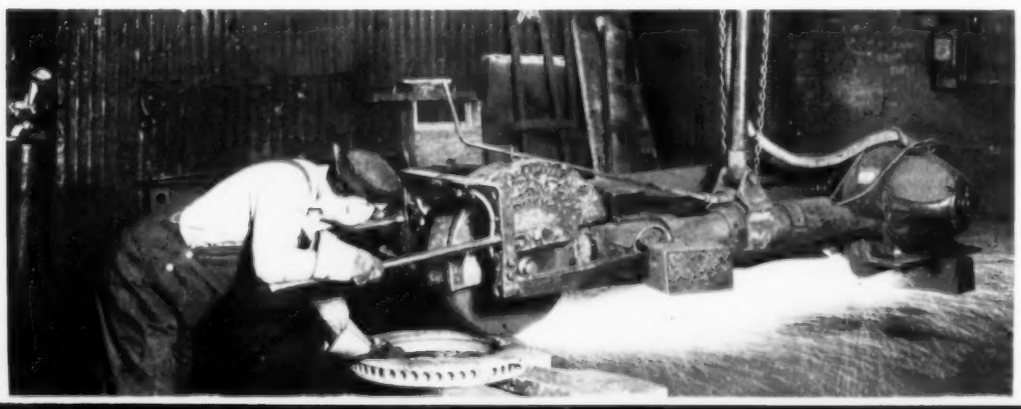
MOULDING MACHINES

MACKLIN
Grinding Wheels



Macklin Grinding Wheels are widely and efficiently used on all types of Foundry jobs. When floor stands and swing frame grinders are Macklin equipped production runs smoothly and economically. Let Macklin Grinding Wheels "Protect Your Production" with their fast and free cutting action.

Ask for the services of a Macklin Sales Engineer who, without obligation, will gladly help you with your grinding problems.



MACKLIN COMPANY

Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

***Sales Offices:*—Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia**

(*Concluded from page* 46)

Clarke is a fancier of these cast iron objects which were familiar figures on lawns of many an old home. He has several in front of his home in Detroit. He is a full-fledged member of the Guild of Former Pipe Organ Pumpers, an organization sponsored by one Chet Schaefer of Three Rivers, Mich., the principal mission or *raison d'etre* of which is the "preservation and collection of ferrous fauna."

The GFPOP holds regular meetings around the country, it is understood and for a number of years has gone about its quiet way of protecting age-old cast iron *objets d'art* from the ravishing hands of a new and unappreciative generation. Monroe Steel Castings has perpetuated the good name of Rex in watermarks on company stationery and in a mural-size photographic enlargement in a hallway of its new offices.

What promises to be a most enlightening meeting of foundrymen and automotive engineers is scheduled here for Dec. 4 on the subject of relationship between hardness, microstructure and wear of cylinder bores and rings. The Detroit chapters of the A. F. A. and the Society of Automotive Engineers will hear E. K. Smith, Electro Metallurgical Co., Detroit, and P. S. Lane, American Hammered Piston Ring division of Koppers Co., Baltimore, present the case for cylinder iron on the one hand, and piston ring iron on the other. Many weeks of advance preparation has been expended by both speakers in assembling data for this presentation which is of vital interest to foundrymen in the automotive industry.

Improve Design on Lathe Castings

Warner & Swasey Co., machine tool builders, Cleveland, have developed a new type of construction in cast iron alloy lathe beds which it is claimed increases the strength and rigidity approximately 30 per cent. Now adopted as standard on all but the smallest machines the new construction features diagonal ribbing similar to bridge girder design instead of the conventional box type ribbing. All the stiffening sections are on the outside walls. This insures greater freedom from twist and vibration, an important feature under present day demands for higher speeds and closer limits without subsequent grinding. Chips clear more easily through the openings and fall into the pan. The diagonal ribbing extends into the section below the headstock. This with an outer tie member between head and bed gives considerably increased strength in this region. The total weight of the casting is not increased and the greatly increased rigidity is attained through more even distribution of the metal. The new design is the result of cooperative effort by the company's development, research laboratory and engineering departments.

Suggests Standards For Apprentices

At a meeting of the apprentice training committee of the A.F.A. during the 1939 convention in Cincinnati, the subcommittee submitted a report which was accepted. At the first meeting of the board of directors July 26, 1939 the report was approved for publication as A.F.A. *Recommended Tentative Standards of Patternmaking Apprenticeship.* The report now is available to members who may write in to headquarters of the A.F.A., 222 West Adams Street, Chicago. Members of the subcommittee who prepared the report include: Chairman, B. B. Wittfoht, Caterpillar Tractor Co., Peoria, Ill.; Frank Cech, Cleveland Trade school, Cleveland; J. E. Kemp, Walworth Co., Kewanee, Ill.; W. H. Ruten, University of Nebraska, Lincoln, Neb.; Wayne Stettbacher, Employers' association of Detroit, Detroit; J. R. Van Kooy, Milwaukee Vocational school, Milwaukee.

Basically the recommendations do not differ from the fundamental principles of apprenticeship as established for other industries, except for those factors peculiar to the patternmaking trade. The report is presented under four headings: Fundamentals of apprenticeship; patternmaking apprenticeship standards; general suggestions; appendix. Sample forms of apprentice contracts are attached to the report; also lists of tools to be acquired during the first, second, third and fourth year. Samples of work schedules are presented accompanied by outline of shop practice for a 4 year course for wood and metal.

Section under the heading "Fundamentals" covers administration; management; supervision; number of apprentices and stabilization of employment. The second section, "Patternmaking Apprenticeship Standards" defines the apprentice; selection of apprentices; length of apprenticeship; probationary period; apprenticeship agreement; schedules of shop practice; 4 year course for wood patternmaker; 4 year course for metal patternmaker; related instruction for patternmaking apprentices; schedule of school instruction; instruction forms; attracting interest of boys, parents and school authorities; schedule of advancement.

The third section "General Suggestions" deals with following the schedule; keeping apprentices interested in work; co-operation with foremen and executives; interesting apprentices in school work; planning lessons for school; graduation; records.

The report covering 28 typewritten pages is exceptionally complete in detail and should prove of decided interest to those contemplating the establishment of an apprentice training program, or as a basis of comparison for plants where a training program already is in existence.

Productive Equipment Corp., 4600 South Kedzie avenue, Chicago, manufacturers of vibrating screens has appointed the Western Machinery Co. as its sales agent in the western section of the United States. The main office of the Western company is located in Sacramento, Calif., with branch offices in Denver, Colo.; Los Angeles; Phoenix, Ariz.; Salt Lake City, Utah; San Francisco and Spokane, Wash.

Diagonal ribbing increases strength of the bed casting approximately 30 per cent

THE ADVENTURES OF BILL

By PAT DWYER

Drawings By RICHEY

WHEN I was a young lad going to school," Bill said, "I had more or less trouble with all the subjects. Maybe I was not overly bright, but my recollection seems to indicate that the majority of the scholars shared my views in a dislike for absorbing the mysteries of the three *R*s. This dislike, in a general way, also embraced the whiskered teacher, looked upon as the active agent responsible for our hours of misery. Looking back now from my present coign of age and wisdom (says you) I am inclined to the opinion that the poor, unfortunate creature deserved pity rather than loathing in his valiant and apparently hopeless effort to pound a little knowledge into the heads of a totally uninterested gang, wild as hawks and restless as the inhabitants of an ant hill."

"From occasional scraps of conversation picked up here and there," I said, "I have gathered the general impression that youth still regards school as a kind of jail and that as unwilling martyrs they are entitled to some kind of a medal for attendance. See Hebrews XIII, 8."

"Thirteen and eight what? Is that a Semitic section of the famous 40 hommes and eight chevaux? I have seen some schools as tightly jammed with kids as a box car with 40 husky hommes, but I fail to see any connection—"

"I was afraid the Biblical allusion would go over your head. We shall have it stricken from the record. Carry on. En avant and—er—all that jolly old kind of thing. You were touching on memories of the dear old school where you learned nothing."

"Well," said Bill, "I'll tell you. You are partly right, but mostly wrong. 'Tis true I never gladdened the master's heart by rattling off the lessons with parrot proficiency, but on the whole I cannot say that my few school years were a total loss. I learned the value of a shrewd upper cut and the importance of getting in the first blow in an argument. Manual dexterity, co-ordination of the eye and the hand were developed through the use of the pea shooter and sling shot, one for light and the other for heavier work. Constant practice and if I may say so in all modesty, a natural gift, brought to full flower the ability to invent excuses and alibis for any type of irregularity. Incidentally this accomplishment pulled me out of some tight corners in my early foundry days when the gaffer and I failed to see eye to eye on the cause of a lost casting. However, I never learned to spell."

"Nothing to it. Take practically any word, divide it into syllables and there you are."

"That's what you think. Off hand I couldn't tell you whether syllable begins with sil or syl or whether the *l* is double or single. If the spelling followed the sound I could make a stab at it, but dash it all, so many words are stuffed with so many useless extra letters that I am at sea, in a dense fog without either sextant or compass. Talking about the sea reminds me of Gloucester. Do you know how to spell the name of that town down on Cape Anne? The word is pronounced Gloss-ter with the accent on the gloss, but that does not do you much good in the spelling of the name as written."

Gent in the center wants peace

"Well," I admitted, "that is a kind of a tough one and might puzzle a stranger in the town, or a reader when he first sees the word in print. However, up and down the Atlantic coast, the town and the harbor and the famous fishing fleet are as well known as the port of New York. Gorgeous summer homes and magnificent estates all along the north shore and around Cape Anne belong in many instances to owners from the middle west. An earlier generation of readers knew Gloucester through Kipling's epic *Captains Courageous*. The present generation knows it through a filming of the same emotional drama. Thousands of people have read the stories of James B. Connelly, better known as 'Out of Gloucester Connelly'—"

"If you want to drag in all the writers," Bill interrupted, "kindly leave a place for a lad from Boston who spent a couple of weeks with me last summer. This was the first time he had been west of Albany. With his tongue delicately poised in one check and with occasional pieces of advice and encouragement from the present speaker, he wrote a letter to his grown up sons.

My Dear Boys: Between one thing and another and never a minute to myself, I have been so busy since I came out here to the Far West, that really I could not find the time before now to write a letter. Everything is so strange, so different from the calm and well ordered routine of our dear Boston and Gloucester, that I hardly know where to begin.

I rather expected to see flocks of wild Indians careering around on their pinto ponies and shouting their horrid war cry, but there is not one in the place except they may be hiding ready at a moment's notice some dark night to raid the settlemnt and lift our hair. I would not mind so much, but I had such a nice permanent before I left home. When I asked one of cowboy natives the other day about the Indians, I had not seen any of them around, he said that the Indians had gone East some where, Boston, or New York, or Philadelphia or some place down

(*Continued on page* 52)

Federal's New PEACH Parting!

The Parting You've Been Waiting For

Federal's PEACH PARTING contains NO free silica, or other harmful elements, yet it has all of the desirable qualities of tripoli parting. It is light in color, insures a perfect lift, permits swabbing and will not build up on match plates. It is less expensive because a smaller amount is required owing to the fact that its specific gravity is such that it settles evenly, immediately, and does not "float" away. We believe it is just the parting you've been waiting for. Why not let us send you a sample or a trial order?

IMPROVED WONDER CUTTER

Designed for corerooms, the Improved Wonder Cutter will cut all lengths of core wires and rods up to and including ⅝" diameter as well as square bars up to ⅜". Its special die steel cutters make it practically immune to wear. Write for descriptive folder.

RUBBER COVERED SHOVEL HANDLE

One of the "biggest" little items in the foundry Federal Rubber Pein Grips are the best possible insurance against the hazard of damaged patterns, flasks and core boxes. Ideal for the foundry and the core room. They will fit any make shovel, can be purchased separately or complete with Federal Shovels. Why not put Federal Rubber Pein Grips on your present shovels or order your next lot equipped with them? Their low cost will surprise you.

FEDERAL GREEN BOND

Still the favorite and ideal bonding clay after 13 years' world-wide use throughout the foundry industry. Green Bond develops the proper amount of dry strength to prevent cuts, washes, and other defects. By its use, permeability and green bond strength are controlled at will. By comparison, Federal Green Bond (Wyoming Bentonite) will show 25 per cent greater durability than Mississippi or Alabama bentonites. The use of Federal Green Bond is fully licensed under U. S. Pat. Nos. 1657573, 1509406, 1509478, and Canada Pat. Nos. 249251, 249252.

The FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland, Ohio

CHICAGO CHARLEROI, PA. DETROIT MILWAUKEE MINNEAPOLIS NEW YORK ST. LOUIS RICHMOND, VA. UPTON, WYO.

(*Continued from page* 50)

that way. So far as he was concerned it did not make much difference. They were dying on their feet any way—fourth place and what do you know about that—and he for one did not care if the whole gang took a long running jump in the ocean while they are handy, and never came back. I don't think that was a very nice thing to say. Do you? I am sure dear Fennimore Cooper would not talk that way about Hunnygunkle or whatever was the name of that Michigan or Mohican fellow, always saving the life of old Natty Bumpo, the Long Carabine!

The people here are all right, if you know what I mean, but they certainly do things to the English language that would not be tolerated by us for an instant. Rather difficult to understand at first, but I gradually have become accustomed to their idioms and methods of speech. I have to smile tolerantly when I hear them refer to curb, water, butter, oyster and other words ending in the letter *R*. I am afraid they never will learn to pronounce them correctly as koib, watah, buttah, oystah, etc. Still they seem to understand each other and I suppose that is all that really matters. One must be tolerant, you know and exercise the Christian virtue of charity. By the way, a curb out here is not the stone edge of a sidewalk. It is a kind of dohickey or emergency brake fastened to a horse's chin to let him (the horse) know who is who and why. And believe me, some of them need some telling.

This settlement of Cleveland is on the edge of a great body of water which I have been told is over 200 miles in length. Can you imagine! Almost as far as from Boston to New York. The natives call it a lake, but to me it seems more like the ocean. The strangest thing about it is that the water is fresh instead of salt as I have been accustomed to seeing it every where along the coast at home. The people here bathe in it, sail boats on it, dump all their sewage into it, sprinkle their patches of maize with it and even drink it. On this last point I was slightly timid at first, but I have drank some of it lately and so far as I can see it has no more harmful effect than the pure, sparkling water that flows through the city mains in Boston. Another funny thing. There is a salt bed under the lake and a factory here pumps water down, then up, evaporates it and makes salt out of it. What do you know about that? I always thought they dug salt out of a mine. Of course Robinson Crusoe made his own salt from sea water, or at least he claimed he did, but I always have thought he was a little touched in the head. Him and his goats!

Shortly after I came here, I was given a hint that my Boston hard hat might attract undesirable attention. The idea! Flat, round and vogue to the last detail, the hat matched the remainder of my costume and blended harmoniously with the rural surroundings. Out here the hats run to rather high crowns and are referred to whimsically as 5-gallon, 7-gallon and 10-gallon sizes. We went down one day to the local trading post and I got fitted out with a 10-gallon model, a big, black sombrero about 2 feet in diameter and about 4 hands high.

I have not yet got the chaps—a species of leggings like Brian O'Lynn's britches, wooly side out and skinny side in—nor the blanket. However, in a few days after Bill has had a good day along his trap line, I expect he will give me a few furs to exchange for one of the gaudy garments. Once or twice a year a tin type peddler goes through this section of the country. If I can whistle him to a stop I shall have a picture taken in the native costume and send you a copy. I am taking lessons now in the use of the lariat, better and more accurately known back home as a lasso. When I go back I shall take a length of clothes line and show you how to catch things. I doubt if ever I shall be sufficiently skilfull to spin one in a ring and dance inside. Looks easy, but one trips so easily and you know how I loathe chewing gum.

We live in a nice little birch bark tepee with a hole in the top for some of the smoke to go out. Most of it stays in. In the evening when the air gets a bit coolish we creep into our sleeping bags, stretch out on the floor with our feet to the fire—just like the spokes of a wheel—and sleep quite comfortably. The mosquitoes were a bit bothersome at first, but since my hostess showed me how to daub myself all over with axle grease I have had no further cause of complaint. Of course the axle grease is slightly aged and rancid, a bit high you might say, and as a result in the morning the place does not smell quite as sweet as a boudoir on Beacon street or in the Back Bay. One gets used to the smell and give me comfort every time is what I always say.

I don't think it ever rains in this far western country, at least I have seen none since I came here. I was talking to our nearest neighbor, a widow woman who lives a couple of miles down the trail, near the big tree where you turn down to the water hole. She told me the place is almost as dry as Kansas or another town or something named Texas where she lived when she was a young filly. Down there she assured me some of the bull frogs were seven years old before they had a chance to learn to swim. That's kind of hard to believe, isn't it? Seven years is quite a spell to go without a wash.

She is a nice woman too, except that she chews tobacco with a few remaining stumps of yellow teeth. She cannot spit straight, or with any spirit or venom. Years ago she claimed she could spit in a rattlesnake's eye at 10 paces and put him or her or it as the case might be, out of business. She is all right on a calm day, but a bit of a menace in a stiff breeze. She lets the stuff kind of fly at random and I was kept busy dodging out of range of the broadsides.

I may stay out here a week and

(*Concluded on page* 84)

If he ever backs into them there spurs, he will have something to write home about

The ACCO Chain-Maker says:

New *End-Welded* Alloy Sling Chains Deliver 4 TO 1 Longer Service

"ENDWELDUR"

● These chains endure under elevated or sub-zero temperatures, moderate impact loadings, and bending and gouging, because of the end-weld construction which protects the weld from serious abuse.

You'll find it profitable to buy Endweldur and all other types and sizes of industrial and hardware chain made by the American Chain & Cable Company, the world's largest manufacturer of welded and weldless chain for all purposes.

We have complete stocks—from dog chains to log chains—from tire chains to sling chains—from sash chains to anchor chains.

Write for free booklet on Registered Sling Chains—tell us your chain problems—our engineers will gladly offer practical suggestions. American Chain Division, American Chain & Cable Company, Inc., Bridgeport, Connecticut.

ACCO
TRADE MARK

AMERICAN CHAIN & CABLE COMPANY, Inc.

AMERICAN CHAIN DIVISION • AMERICAN CABLE DIVISION • ANDREW C. CAMPBELL DIVISION • FORD CHAIN BLOCK DIVISION • HAZARD WIRE ROPE DIVISION • HIGHLAND IRON AND STEEL DIVISION • MANLEY MANUFACTURING DIVISION • OWEN SILENT SPRING COMPANY, INC. • PAGE STEEL AND WIRE DIVISION • READING-PRATT & CADY DIVISION • READING STEEL CASTING DIVISION • WRIGHT MANUFACTURING DIVISION • IN CANADA: DOMINION CHAIN COMPANY, LTD. • IN ENGLAND: BRITISH WIRE PRODUCTS, LTD. • THE PARSONS CHAIN COMPANY, LTD. • *In Business for Your Safety*

Baltimore-Washington

FOUNDRYMEN HOLD REGIONAL CONFERENCE

WITH an attendance exceeding 250, and an excellent technical program covering numerous phases of practical and technical problems, the Baltimore-Washington regional foundry conference held at the Lord Baltimore hotel, Baltimore, Oct. 20 and 21, was exceptionally successful. The conference was opened on Friday morning by Paul S. Lane, American Hammered Piston Ring division, Koppers Co., Baltimore, and chairman of the committee which arranged the various details of the program. Mr. Lane introduced S. J. Cort, general manager, Bethlehem Steel Co., Baltimore, who extended a cordial welcome to the conference visitors. In his opinion the technical side of industry is doing the best job today, and the foundry industry, through regional conferences, conventions, and the exchange of information, is making progress in the production of a better product at a lower cost. Mr. Cort stated that never has there been a time when so much has been demanded of castings.

Robert E. Kennedy, secretary, American Foundrymen's association, Chicago, expressed appreciation on behalf of the association for the splendid work done by the Baltimore committees under the chairmanship of Paul Lane. Mr. Kennedy outlined the work of the association, stressing the committee activities, chapters, publications, exhibits, and the contributions to safety and hygiene. L. H. Denton, convention manager, Baltimore association of commerce, welcomed

(*Continued on page* 57)

Fig. 1—V. A. Crosby. Fig. 2—Donald J. Reese. Fig. 3—S. W. Brinson speaking. Fig. 4—S. J. Cort. Fig. 5—D. M. Curry. Fig. 6—J. C. Pendleton. Fig. 7—Paul S. Lane. Fig. 8—Max Kuniansky. Fig. 9—(Left to right)—Paul S. Lane, J. Greenstreet and Robert E. Kennedy. Photos courtesy of Richard D. Taber, American Hammered Piston Ring division, Koppers Co., Baltimore Md.

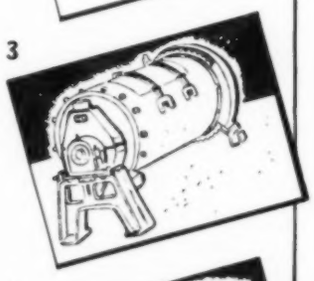
SAVE

ON BLAST CLEANING EQUIPMENT AND DUST CONTROL SYSTEMS

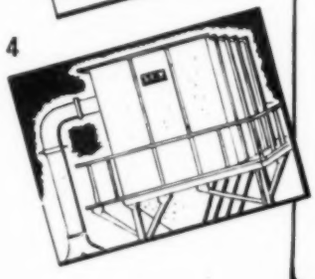
Buy SLY

1. BLAST ROOMS Specifically engineered to handle the size and weight of your pieces. Ventilated and lighted to insure healthful, productive working conditions. Planned to keep maintenance costs at a minimum.

2. BLAST MILLS Tilted barrel and perforated bottom insure thorough mixing. Continual turning brings bottom pieces up for powerful blasting. Low in first cost and very inexpensive to operate. Available in various sizes.



3. TUMBLING MILLS Furnished in standard units of modern design for low cost cleaning. Heavy shell, anti-friction bearings for low maintenance, improved exhaust, feeder for faster cleaning and correct door design all guarantee superior performance.



4. DUST CONTROL EQUIPMENT Designs for every operating condition. Simple in construction, easily installed and economical in space and power. Flat *special* cloth bag filters and mechanical shaking device produce most effective dust control.

The Sly Line Also Includes: Blast Cabinets and Blast Tanks of Various Types and Sizes, Blast Cleaning Accessories, Sly DURABLAST Metal Abrasives, Sly PURAIR Helmets.

During our 65 years of service to the foundry industry we have met and solved hundreds of problems on blast cleaning and dust control. We have a thorough understanding of foundry needs and know how to meet them most economically and satisfactorily. Whatever your problem, write for recommendations—no obligation.

1874 TO 1939
65 YEARS
OF SERVICE TO
THE INDUSTRY

THE W. W. SLY MANUFACTURING CO.
4753 TRAIN AVE. Established 1874 CLEVELAND, OHIO

BLAST CLEANING EQUIPMENT SLY TUMBLING MILLS
DUST CONTROL EQUIPMENT FOR EVERY INDUSTRIAL PURPOSE

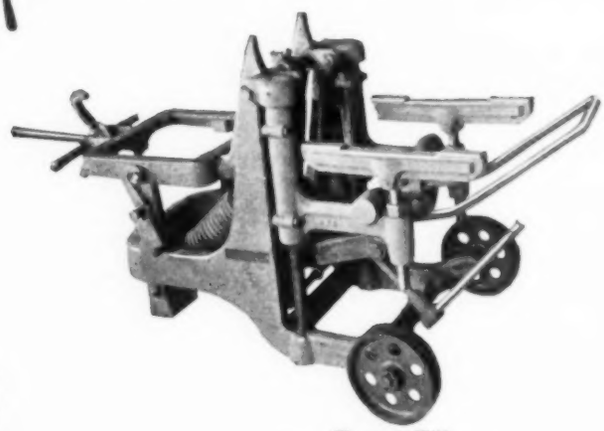
WHY WORRY

ABOUT THE SHORTAGE OF SKILLED FOUNDRY LABOR

Inexperienced Help are Producing Molds and Cores Efficiently and Economically with

CHAMPION ROLLOVER AND DRAW MOLDING AND CORE MACHINES

Type "JM"
Power Jolt Hand Rollover and Draw



Type "H"
Hand Ram and Draw Rollover Machine

Type "JR"
Power Jolt Hand Rollover and Draw Core Machine

Rollover Draw machines will handle a wide range of work. Difficult jobs requiring uniform ramming and accurate draw are produced as fast and easily as the simple jobs.

CHAMPION ROLLOVER DRAW MACHINES are simple in design, adjustment and operation.

If you have a job for any of the above machines, we will gladly ship equipment on trial. Send sketch, flask dimensions and production requirements for our recommendations.

Manufactured in Canada by John T. Hepburn Limited, Toronto

CHAMPION FOUNDRY and MACHINE CO.

1314 West 21st Street - - - - - - - Chicago, Ill.

(*Continued from page* 54)

the visitors on behalf of the city.

Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., presided at the first technical session devoted to cupola practice. Donald J. Reese, International Nickel Co., New York, presented an interesting talk on the application of the cupola to gray iron foundry practice. Mr. Reese first discussed the fuel-metal relationship and stated that coke is almost as important a metallic component of the charge as pig iron. Not all of the fuel is used to generate heat, but some goes into the metal.

The speaker stated that it is entirely possible in cupola operation to establish a range of carbon control within a limit of 5 points, but this requires attention to the factors of detail and control. In discussing metal temperature losses, Mr. Reese stated that it is easy to establish good temperature control at the spout, but too often the metal of a good temperature is abused before it is poured into the mold. Frequently the drop from the cupola spout to the mold is 200 degrees and numerous instances may be found where from 400 to 600 degrees loss takes place. Unless proper attention is given to the handling of the metal from the spout to the mold, there is not much use of spending a lot of time on cupola control, since cupola control is one of the important factors in producing a better product. Not enough attention is given to preheating the ladle, according to Mr. Reese, and the refractory used often is too light. Introduction of insulated ladles is progressing rapidly.

Size and Weight are Important

Mr. Reese pointed out that in melting the size and weight of the materials going into the cupola are of extreme importance. Coke should have a diameter not exceeding 1/12 the diameter of the cupola. The maximum dimension of the iron should not exceed 30 per cent of the cupola diameter. Use of larger materials will widen the band of fluctuation, result in bridging for varying periods of time, and permit less melting control. Of course, the greatest difficulty is in securing the ideal size of steel scrap. Mr. Reese then described the five melting zones in the cupola, stated that in his opinion the charging floor should be from 18 to 22 feet above the tuyeres, and outlined the functions of the coke bed. He discussed the method of slagging and stated that slag provides an insulating material against the cold blast and also a filter to remove nonmetallics. In concluding, he discussed methods of tapping and important features of proper cupola air supply.

A simultaneous session devoted to bronze melting problems was presided over by H. B. Gardner, Nonferrous Ingot Metal institute, Wash-

(*Continued on page* 60)

Fig. 10 (Left to right)—H. B. Gardner and Roger Keeley. Fig. 11—Harry W. Dietert. Fig. 12—Standing left to right, William Franz, H. F. Taylor, Edwin W. Horlebein, S. W. Brinson, C. L. Frear, and J. A. Reese; sitting left to right, J. C. Pendleton, Paul S. Lane, J. E. Crown, and C. M. Saeger Jr. Fig. 13—L. H. Denton. Fig. 14—Registration. Fig. 15—C. M. Saeger Jr. Fig. 16—W. G. Reichert. Fig. 17—R. G. McElwee. Fig. 18—George Evans speaking. Fig. 19—Robert E. Kennedy. Fig. 20—Round-table luncheon

THE *Speedmullor* VISITS YOUR SHOP REGARDLESS OF YOUR LOCATION

MANY THOUSANDS OF MILES

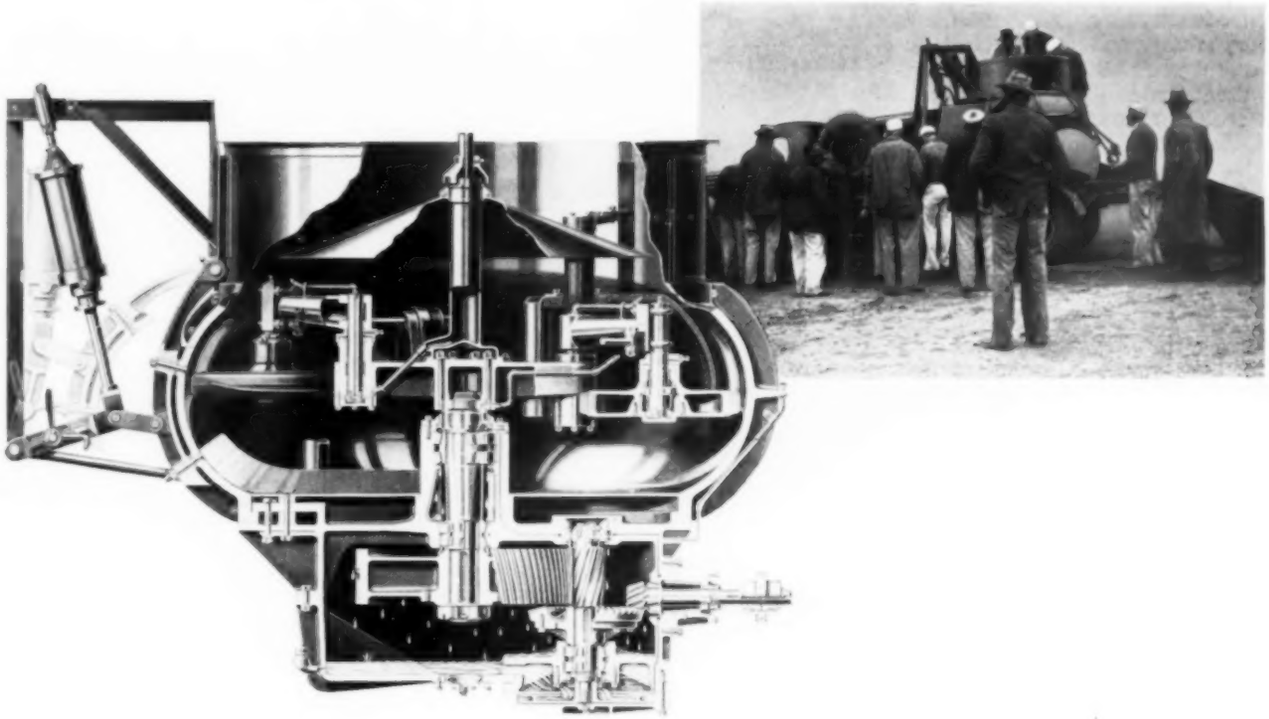
ARE TRAVELED TO SHOW YOU

There are several ways to learn how any mulling equipment meets your needs for properly conditioned backing, facing and core sand. You can write to the manufacturer in response to advertising and he will send descriptive literature and data. You can take the time from your work to visit shops where equipment is installed, and there see it in action on the other fellow's job, with the other fellow's mix. You can write to users for their reaction if you are inclined to make such important purchases on hearsay. All of these steps are helpful, but they are not conclusive evidence. They fail to show how the machine will perform in your shop, with your sand, *as the Speedmullor Caravan does under your exact working conditions.*

OR . . . *a mighty important little word when you are buying equipment* . . . YOU may see the *B&P Speedmullor* in action in your plant, mulling your exact mix under the identical conditions that make your sand problem different than the other fellow's. The *SPEEDMULLOR CARAVAN* has traveled thousands of miles to prove beyond the shadow of a doubt that it is the fastest mullor ever built and the best mullor ever built. It loads, thoroughly mulls and discharges the batch in a few seconds—never more than 2½ minutes regardless of the mix. That's why the *Speedmullor* has traveled thousands of miles to show foundrymen everywhere "the last word" in mulling speed, sand quality and low cost per ton. *We want you to see before you buy.*

The BEARDSLEY & PIPER Co.

THE *Speedmullor* MULLS YOUR SAND
FASTER . . . BETTER . . . CHEAPER



MANY THOUSANDS OF FOUNDRYMEN
HAVE SEEN THE Speedmullor PERFORM

The *Speedmullor Caravan* is a self-contained mobile demonstrating unit that is completely equipped to mull sand within 5 minutes following arrival at your plant—requiring no power or service from you. It has traveled thousands of miles and into hundreds of foundries to prove its greater efficiencies before thousands of foundrymen. The *Speedmullor* mulls the kind of sand you are using every day. The mix you need and want is the mix we'll mull faster, better and cheaper—just as *Speedmullors* are doing daily in dozens of America's leading foundries. You specify the job; we do the work, whether it be a core sand, gray iron facing and backing or steel facing and backing. You shall be the judge. The decision rests with you.

One foundry superintendent called the *Speedmullor Caravan* direct evidence of superiority—straight line proof of ability to produce—the shortest distance between the manufacturer's claims and actual performance in the field. He bought a *Speedmullor* because he was shown before he was asked to buy. He saw *Speedmullor's* superior accomplishments in his shop on his sand, with his own eyes. He was able to check and double check the results and advantages long before he placed his order. As with him, so with you. If you wish positive proof of greater mulling efficiencies, lower cost per ton of sand mulled and economy of operation, write and we'll tell you when the *Speedmullor Caravan* shall be in your neighborhood.

2541 NORTH KEELER AVENUE
CHICAGO • ILLINOIS

(*Continued from page* 57)

ington. The speaker was Roger Keeley, Ajax Metal Co., Philadelphia, who spoke on, "Nonferrous Melting Practice." Mr. Keeley presented a number of actual experiences in nonferrous melting, and outlined the methods which were used to solve the particular problem. As an example, he introduced the problem where a foundry was producing miscellaneous castings of 88-10-2 alloy in natural draft, coke fired pit furnaces with crucibles holding approximately 150 pounds in an average charge. Melting time was 2½ hours per heat. Inside dimensions of the furnace were 24 inches high and 16 inches in diameter.

Resulting castings from the equipment were found to be dirty, the metal in the molten stage showed an excessive amount of dross. It was evident that the melting time per heat was too long and the excessive formation of dross indicated an oxidizing atmosphere in the furnace. To eliminate the question as to whether the metal was at fault, a heat of virgin metal was melted and it was found that the melting time and the amount of dross produced were the same.

To prove further that the metal was being oxidized, a rough test with phosphor-copper was made, and it was found that while under proper melting conditions it requires only 1 or 2 ounces of 15 per cent phosphor-copper to insure complete deoxidation of the alloy, the metal under question required 22 ounces to accomplish the result. Investigation showed that the connecting flue from the furnace to the stack measured 9⅝ x 5 inches or a total of 48⅛ square inches, which appeared to be excessive in proportion to the area of the grate. By inserting fire brick in the flue, the area was reduced to 36 square inches and additional heats were melted in approximately 1¾ hours and only the normal amount of dross was formed.

Analysis Usually Is Compromise

The first afternoon session was devoted to alloy and high test cast irons, with Paul S. Lane as chairman. R. G. McElwee, Vanadium Corp. of America, Detroit, discussed the type of base iron necessary in producing alloy iron. Mr. McElwee stressed the importance of melting practice procedure and outlined the advantages disadvantages and features of electric, cupola, and air furnace melting. He pointed out that the element of time is an important factor in the production of good iron. Also various types of melting units have different types of atmospheres. He stressed the fact that it is difficult to write a chemical specification for an iron that will describe the iron and will permit any foundryman to produce it. The buyer must work out with his source the type of casting needed, and then stick to that source of supply.

In practically all cases, selection of an analysis for a particular type of casting must be a compromise. Mr. McElwee believes that in a great many cases, a better choice of analysis might be made than that now used. He discussed advantages and disadvantages of end treatments or the addition of alloying materials before pouring. End treatments have been varied in character. Mr. McElwee stated that while ferrochromium is used to harden, high carbon ferrochromium has a bad solution point. With a lower carbon material, hard spots will be eliminated. Alloys for an end treatment to produce a softening should have the proper chemical reaction, be in the desired physical form, namely heavy and stable, should have products of the reaction which can be removed, must be impotent or in other words have no effect where an excess amount is added, and must be economical to use.

Alloys for Special Properties

The second paper at the session was entitled, "Alloy Cast Irons," was presented by V. A. Crosby, Climax Molybdenum Co., Detroit. Mr. Crosby stated that cast irons are alloyed to obtain certain special properties and each of the elements were considered in the light of specific contributions to properties in the finished casting. He pointed out that no element enjoys the position of fulfilling all requirements. Therefore, careful study must be given each element in the light of the requirements desired. In the case of corrosion and heat resistance, the choice of elements to use is pretty well narrowed down. When considering mechanical properties, available alloying elements, and combination of elements, one has a wider choice. The speaker stated the ultimate decision should be governed by degree of improvement desired, and character of service requirements. Applications requiring maximum toughness and strength at machinable hardness dictate one step of alloy combinations; maximum dry abrasive wear resistance dictate another; mold graphite refinements and mild tensile strength improvements require still another consideration which may include a wide range of alloying elements in low percentage concentration. While economic considerations are a dominate factor, Mr. Crosby called attention to the advisability of considering alloy costs in the basis of finished castings ready for service, rather than in the increase in cost of the alloyed metal at the spout.

The speaker stressed the advisability of producing an iron of good casting properties, thus assuring freedom from shrinks. Such an iron then can be alloyed for strength. Solidity of metal is of first importance and most difficult to obtain as the carbon is reduced. Mr. Crosby presented a group of slides showing the effect of certain alloys, and application of a number of alloyed castings. In general higher carbon irons were recommended than usually is advisable where alloys are to be used. Mr. Crosby stated the higher carbon irons show less tendency to warp and distort in service, possess better lubricating surface for wear, and have much greater resistance to heat checking in such applications as brake drums. Last but not least, through a higher carbon metal, a more fluid, more castable product is obtained. The range considered is from 2.75 to 3.60 carbon.

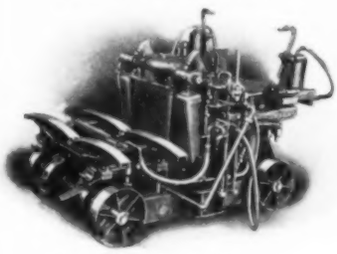
The final afternoon session was devoted to the cement molding in both steel and gray iron, and was under the chairmanship of J. E. Crown, Naval Gun Factory, Washington. J. C. Fendleton, Newport News Shipbuilding & Drydock Co., Newport News, Va., described the Randupson process for making iron, brass and steel castings at the Newport News Shipbuilding & Drydock Co. Mr. Pendleton stated that patterns for cement molds are constructed in the usual way. Coreboxes may be used to form the entire mold. He stated that it is much easier to form drawbacks and cores when the cement system is used. Some protection is necessary to prevent cement from gripping the pattern. Some plants use oil, others a lacquer, and others a mixture containing aluminum.

Moisture Low in Cement Sand

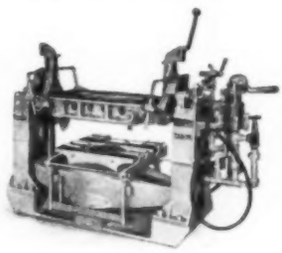
Cements used are of the early setting or 48-hour type and do not have the same chemical reaction as other cements, although they do form in a like manner. Using a sand of the proper analysis and No. 50 fineness to make a mixture of 12 per cent cement, 88 per cent sand plus 6¼ per cent moisture, will result in a mold containing 2½ per cent moisture at the expiration of 72 hours. Experience has shown that a 7 per cent moisture addition is more suitable for steel, while 6.5 per cent moisture is better for iron molding and 6 per cent for bronze. If the previously mentioned mixture is exposed to a temperature of 400 degrees Fahr. after 72 hours drying in air, the moisture can be reduced from 2.5 to 1.25 per cent. The same

(*Continued on page* 62)

Column Jar Squeezer



Hinged Jar Rollover Pattern Draw Machine



Trunnion Jar Rollover Pattern Draw Machine

Jar Flask-Lift Machine

Jar Squeeze Flask-Lift Machine (Pintle Post)

Plain Jarring Machine

The Right Type Machine for Any Molding Need...

TABOR

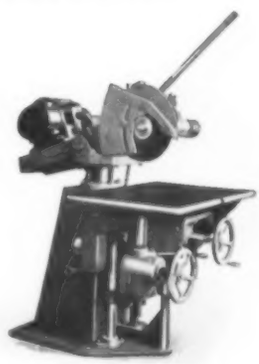
TRADE 1884 MARK

MOLDING MACHINES

You will find the right type of molding machine for almost any foundry need among the extensive line of Tabor equipment. Where we cannot recommend a standard model to meet your requirements properly, we will engineer and build a machine that will. Fifty years of foundry experience is yours for the asking. May we consult with you on your molding problems and needs?

TABOR-BRASIVE CUT-OFF MACHINE

A remarkable machine as hundreds of foundrymen-users will tell you. For example, it removes 2-inch risers from pure nickel castings in 12 seconds flat, and makes equivalent speeds on all other tough metals and alloys. In extensive use in leading non-ferrous foundries.



TABOR MANUFACTURING CO.

6225 Tacony Street **Philadelphia, Pa.**

(*Continued from page* 60)

mold again exposed to atmospheric conditions will absorb the lost moisture up to 2.5 per cent or more. Experience has shown that a moisture percentage above 3.5 after 72 hours has led to some trouble with pin holes, buckles and scabs.

The speaker stressed the fact that special attention must be given to gating. Mr. Pendleton stated that making cores for steel castings which will aid in preventing hot tears is an important task. He has found that a core made half of cemented sand and half of synthetic green sand is best suited to prevent that type of defect. The speaker also described the problems encountered in cement molding for steel and iron.

Casting defects and sand in the foundry were discussed at the early morning session Friday under the chairmanship of C. M. Saeger Jr., United States bureau of standards. Causes, prevention and cure of casting defects in ferrous and nonferrous metals were described by William G. Reichert, American Brake Shoe & Foundry Co. The sand situation was reviewed by Harry W. Dietert, president, H. W. Dietert Co., Detroit.

Records are Important

According to the first speaker all complaints of defective castings should be investigated and classified quickly. Records are important. Plotting curves of permeability, strength and moisture content of the sand against scrap losses help to reduce casting loss. The same is true in investigating loss from shrinkage, cold shuts and slag inclusions. Test data and operating routine can be attended to by a boy, but the decision on a course of correction should be made by a man of training and experience. Detailed description was given of the various sand properties, moisture, permeability, bond, grain distribution and size, mold hardness, surface quality of the castings, facing materials, removal and control of fines, elevated temperatures, clay, sea coal.

Many casting defects are caused by contraction and expansion of sand at various temperatures. Cracks are caused by a large contraction in the mold where the mold surface is broken. Buckling occurs when one part of a casting is heated to a higher temperature than another so that the degree of expansion will vary considerably. Rat tails, really a fracture of the mold, occurs in light weight castings where the temperature of the sand does not reach the contraction point, but where the heat is sufficient to expand the sand. Scabs may appear when backing sand is at a lower temperature and will be expanding while the facing sand is contracting. In conclusion the speaker referred to the subject of supervision. There is no substitute for intelligent supervision and there is no substitution for good common sense.

In the second paper, Harry W. Dietert discussed molding sand from the foundryman's view point and dealt first with the methods which should be employed in selecting new molding sand. Presented in order of importance sand properties were given as grain size, permeability, clay content, sintering, grain distribution, fines, durability, dry strength, foreign inclusions, expansion and contraction, hot strengths, deformation and grain shape. New sand should be checked on receipt by either of two methods: Permeability and green strength at a specified moisture content, or clay content and fineness.

Test Sand Periodically

After the sand is purchased the next step in obtaining the best casting results is to institute a systematic sand control program including measuring the moisture, permeability, green strength and deformation daily. For batch mixture equipment these tests should be made at least every third batch of sand. Dry strength test should be made once a week, while once a month probably will serve for clay content and fineness tests.

Sintering test was highly recommended as a research test and as a control test in large foundries to make certain that maximum refractoriness was obtained from the sand on hand. A booklet entitled, "The Sand in Your Foundry," was presented to each member of the audience. The booklet gives complete summary of recommended practices in connection with molding sand. A feature of the publication is a detailed reference to the specific qualities required in sands for aluminum, brass and bronze, copper-nickel light gray iron, medium weight castings, heavy gray iron, malleable heavy and light, steel castings green and dry sand. Another feature lists practically all forms of casting defects with their causes and remedies so far as the sand is concerned.

Gating and risering in gray iron and nonferrous foundry practice featured the Saturday morning session under the direction of C. L. Frear, bureau of engineering, Navy department, Washington. Max Kuniansky presented an interesting discussion of the practice followed by the Lynchburg Foundry Co. in gating a wide variety of large castings. Mr. Kuniansky stated that the practice followed in gating was the gradual development rather than a carefully and definite planned procedure. He described the cupola practice which includes desulphurizing, late addition of silicon and addition of manganese. Carbons in the iron used ranged from 3.10 to 3.80 per cent and are regulated by the use of the pitch coke. The speaker stated that an iron of that type is quite different from that which may be used by many other companies making similar castings. The iron is poured at a very low temperature, somewhat below 2400 degrees Fahr., but because the metal is more fluid than normal gray iron, due to the treatment, the molds are filled rapidly.

As a second portion of this presentation, W. W. Levi, Lynchburg Foundry Co., Lynchburg, Va., presented a series of slides and described the type of gate, pouring temperature, time of pouring, etc., for each casting. In discussion it was stated that the lower pouring temperature reduces the shrinkage and through this means, namely cooling from a rather high melting temperature, some of the problems of shrinkage are taken care of in the ladle.

Gating and Risering

In the second portion of the program, D. M. Curry, International Nickel Co., Detroit, considered the problems of gating and risering as they pertain to nonferrous castings. Mr. Curry sketched a number of interesting castings, such as thin fins and plaques, railroad bushings, valves, elevator worm gears, propellors, packing ring, flange bushings and others, on a blackboard. He then described fully the methods of gating these castings when made in the following alloys: Yellow brass, red brass, aluminum-bronze, manganese-bronze, nickel-silver, monel and nickel. He also discussed many contributing factors which govern the gating of the casting, such as composition, pouring temperatures, rate of pour, sand, etc.

A round table luncheon under the chairmanship of C. E. Bales, Ironton Fire Brick Co., Ironton, O., was devoted to cupola maintenance and refractories. Donald J. Reese pointed out that the life span of a cupola averages approximately 15 years and that many are operated from 2000 to 10,000 times. His experience has shown that the air loss in a cupola seldom is less than 20 per cent and sometimes as much as 50 per cent. He suggested that at least once a year, the tuyeres should be plugged and the air circuit checked to determine leaks and permit proper repairs. He criticized the handling of slag in many

(*Concluded on page* 64)

FOUNDRYMEN SELECT CHICAGO FOR 1940 CONVENTION

Chicago has been chosen as the host city for the 1940 Foundry and Allied Industries Show to be held in connection with the 44th Annual Convention of the American Foundrymen's Association, May 4 to 10, 1940. Some of the advantages which Chicago offers are:

1. A Central Geographical Location.
2. An up-to-the-minute building—The International Amphitheater—unsurpassed in its facilities for operating exhibits.
3. Accommodations for holding all convention meetings and exhibits in one central location.
4. Within easy traveling distance from the majority of A.F.A. Chapter centers.
5. Headquarters of the National Office.
6. All the industrial, commercial, recreational and other advantages of the world's third largest city.

THE AMERICAN FOUNDRYMEN'S ASSOCIATION

222 WEST ADAMS ST., CHICAGO

(*Concluded from page* 62)

shops and stated that it was easy to have the slag deposited into a water stream, perforated buckets, or a mechanical system for carrying it away from the cupola.

Damage to refractories in the melting zone is due to faulty operation, according to Mr. Reese. Most refractories used are well suited for the temperature of the melting zone. However, bridges, either short or long, are formed due to fluctuations in operation, materials, etc., and the heat caused by such bridging raises the temperature of the refractory. Thus a great amount of protection can be afforded refractories by proper cupola operation. Mr. Reese does not believe that the melting zone is the place to use a monolithic lining. He does not believe in patching the cupola if burned out unless sufficient refractory has been removed to put in a split, st.aight or block. He advocated the building of a substantial taphole which will last over many heats.

A. V. Leun, Bethlehem Steel Co., Bethlehem, Pa., discussed the choice of refractories and stated the following factors should be considered in making the selection: Service, slag, temperature, and pressure. In making a choice it must be determined whether slag is acid or basic, and the type of refractory selected should correspond. Mr. Leun then discussed various types of brick and indicated applications. In connection with clay brick, he stated the temperature in the furnace should not exceed that at which the brick was fired in the kiln.

Control Directional Solidification

H. F. Taylor, naval research laboratory, presented a paper on controlled directional solidification of steel castings Saturday afternoon under the chairmanship of S. W. Brinson, foundry superintendent, Norfolk navy yard. At the same session George S. Evans, Mathieson Alkali Works, Inc., New York, presented a paper on the basic principles and latest developments in the application and use of soda ash as a desulphurizer for gray iron.

Commencing with the simplest form, the ingot, the first speaker showed a number of slides illustrating how controlled directional solidification can be exercised over the thermal gradients in a wide variety of steel castings. The pipe or cavity in the ingot results from a part of the normal shrinkage of steel, variously estimated as 10 to 12 per cent of room temperature volume. This shrinkage is divided into three stages, liquid, solidification and solid depending on whether it is considered as that occurring during cooling from the superheat temperature to the point of solidification, or as the casting cools from its solidus to normal temperature. He referred to the use of hot tops and shrink heads and reminded his audience that a feeder is useless unless it remains liquid long enough, and unless an open passage is maintained between the riser and the casting.

Many steel castings are poured through the bottom, a feature in direct opposition to the theory of directional solidification. However, in many cases this feature cannot be avoided in a practical manner and other precautions must be observed to bring about the desired results. In one method the casting is inverted after it is poured. In another the casting is poured while inclined in one direction. The position of the mold is reversed after it is filled with metal. In other instances the first metal enters the bottom and then the remainder of the metal is poured through higher gates or down through the riser. The object, of course, in each case is to provide the hottest metal at or near the top.

Remove Entrained Inclusions

The second speaker pointed out that the majority of foundrymen think of desulphurization in terms of sulphur reduction. They overlook the equal or more important action of soda slags in washing out entrained impurities. As a matter of fact sulphur in varying percentages is essential in the production of high test cast iron. The speaker showed a number of micrographs to illustrate the efficacy of the fused soda ash treatment in removing entrained inclusions. In cupola operation he stated that four pounds of fused ash added to the regular limestone charge usually will reduce the sulphur by 1 to 1½ points. Equal quantities in an all scrap, high sulphur mixture generally will show from 2 to 3 points reduction. However, it is claimed that the effect upon fluidity of the iron and the properties of the finished castings is more pronounced than with ladle treatment.

The second part of the paper was devoted to a discussion of the chemical details and reactions of the process and the greater volume of sulphur reduction where the metal is treated in the ladle under favorable conditions. Carbon present in cupola metal in ordinary percentage, from 2.25 to 3.50 per cent, serves to promote reactions. Low carbon metal is more difficult to desulphurize and no desulphurization of steel will result from ladle treatment. The alkalies accelerate the desulphurization reactions of basic open hearth slags.

Will Hold Regional In California

Northern California and Southern California chapters of the A.F.A. have joined in arranging a 2-day regional foundry conference as a part of the sixteenth annual conference of the iron, steel and allied industries which will be held under the auspices of the California State chamber of commerce at the Del Monte hotel, Del Monte, Calif. on Feb. 8 and 9.

Six sessions will be held during the 2 days of the regional conference including an informal dinner meeting. Subjects for discussion at morning session on Thursday, Feb. 8 include industrial stability, economy for the steel industry, planning for tomorrow, and problems of industry in California. Afternoon meeting sessions include those on operations in the foundry industry, cupola operation, use of castings in ship construction, and hygiene in the foundry. An informal dinner will be held in the evening followed by motion pictures on the foundry and steel industry.

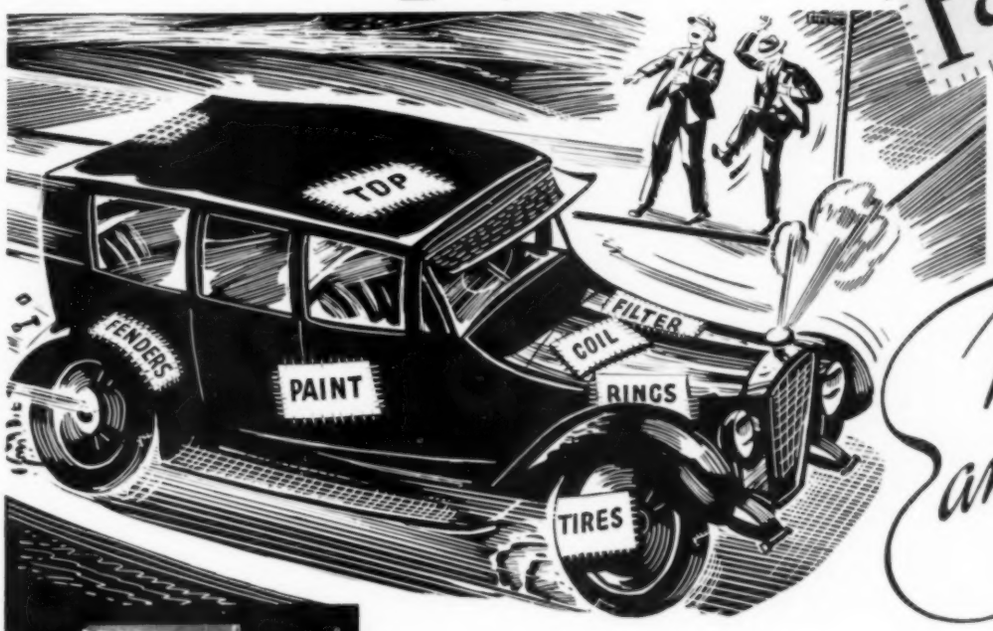
On Friday, Feb. 9 morning session will be devoted to discussions on relationship existing between industry and government, and industrial co-operation with the U. S. Army to build up our own defense. Topics for the afternoon sessions include recent developments in nonferrous operations, use of foundry equipment, and meeting the market needs for metals.

Book Review

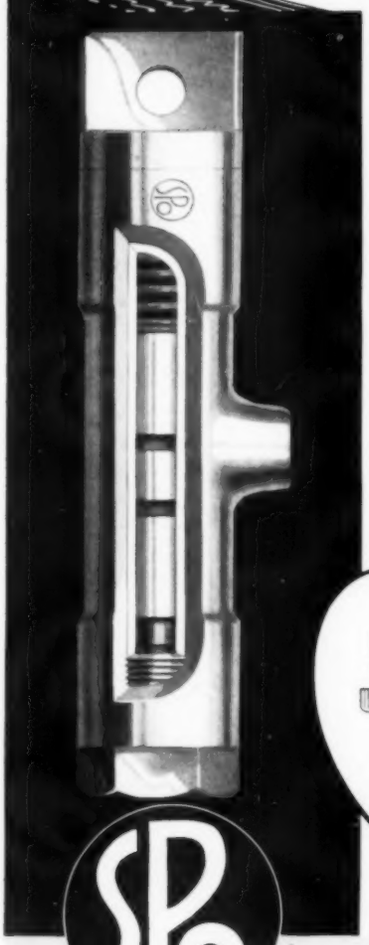
A. S. T. M. Method of Chemical Analysis of Metals, paper, or cloth, 250 pages, 6 x 9 inches, published by the American Society for Testing Materials, Philadelphia, and supplied by THE FOUNDRY for $2.00 in paper cover, and $2.50 in blue cloth binding.

This is the second edition of the American Society for Testing Materials volume on methods of chemical analysis of metals, and gives the latest approved analytical procedures for ferrous and nonferrous metals, and spectrochemical analysis issued by the society. Four extensive standards cover ferrous metals, 12 apply to nonferrous metals and alloys, and three relate to spectrochemical methods for steel, cast iron, open-hearth and wrought iron, and ferroalloys, aluminum and its alloys, copper, brass and bronze, lead, tin, antimony, silver solders, nickel, zinc, and metallic materials for electrical heating. Spectrochemical methods relate to high grade pig lead, determination of lead, iron and cadmium in zinc, and minor constituents in zinc alloy die castings.

Does it pay you to Patch?



No—and here's Why!

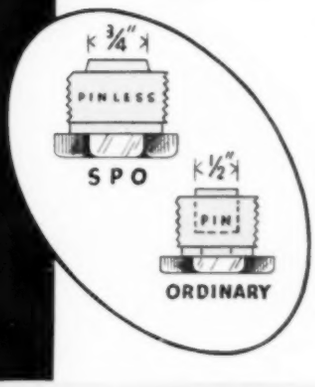


What are vibrators costing you? Worn ones, we mean. First, considerable annoyance to your molders, which causes them to lose probably ten molds a day. Plus a handy wrench or mallet to start them with. Plus 50c or so each to disassemble and reassemble. Plus the actual cost of repairing. And even then—

It's 100 to 1 they'll be no good anyway. Usually three or four days go by, and it's the same rigmarole again. *And the old jaloppy is getting older every day.* In contrast with all this:

SPO Vibrators are guaranteed to give you 100% satisfaction. If they don't, we'll see to it that they do. They have been designed, not to use up old equipment we had on hand, but *entirely in the new*, out of our own extensive experience as foundrymen.

The SPO Vibrator has a body (corresponding to the cylinder in your motor) of heat-treated high carbon forged steel, which has a bushing or liner of special bronze broached and burnished. The plunger (corresponding to a motor piston), of special alloy, is likewise ground to a mirror-like finish. These two delicately finished surfaces make possible exceedingly close tolerances, with well-nigh perfect fitting and operation. The SPO one-piece *pinless* anvil averages $2\frac{1}{4}$ as much striking area as on ordinary vibrators (see diagram). You have a carefully balanced unit that hits equally hard on both ends.



Try SPO Vibrators for a new thrill — *and new profits.*

• • •

SPO designs and builds both molding machines and pattern equipment, and guarantees them unconditionally to produce castings which will be in full accordance with your specifications.

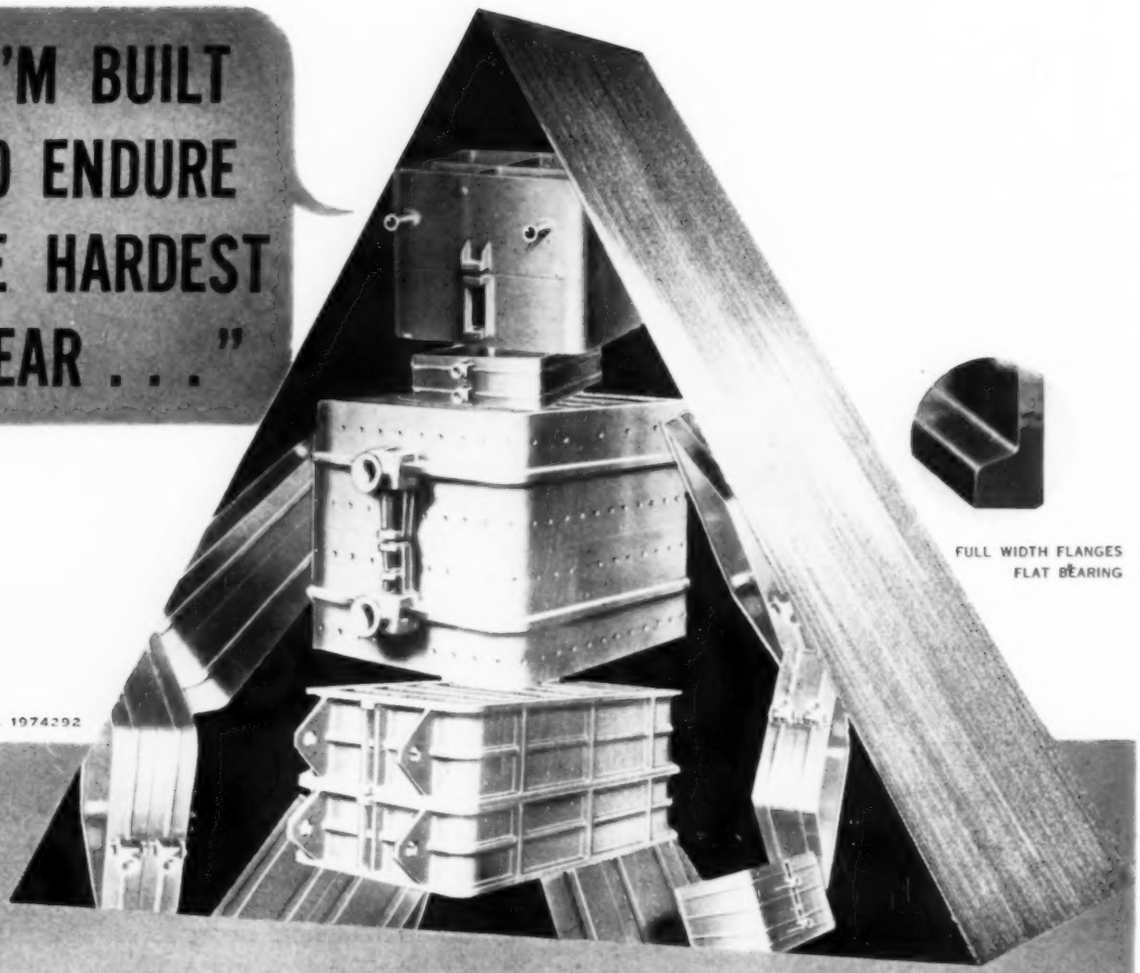
SPO

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators, and Patterns for Production

East 61st Street and Waterman Avenue · · Cleveland, Ohio

"I'M BUILT TO ENDURE THE HARDEST WEAR . . ."



FULL WIDTH FLANGES
FLAT BEARING

PATENT NO. 1974292

STERLING FLASKS will go a long way with you—in saving labor and cutting replacement cost. Their construction resists the hardest wear; it affords maximum strength with minimum weight. Rolled steel, all-welded STERLING FLASKS, with their solid center ribs and full-width bearings, will take all the very toughest wear that increased production can give them. INSTALL DURABLE STERLING FLASKS NOW!

STERLING WHEELBARROW COMPANY

7100 W. WALKER ST.
MILWAUKEE, WISCONSIN

FOUNDRY EXHIBIT OPENED AT Chicago REGIONAL CONFERENCE

OFFICIAL opening of the operating exhibit of the foundry industry at the Museum of Science and Industry, Chicago, was an outstanding feature of the second annual regional conference of the Chicago Chapter of the A. F. A. held at the museum, Nov. 9, 10, and 11. The splendid exhibit, made possible through the gifts of individual foundries, foundry equipment and supply manufacturers, and a number of organized groups within the industry, was presented to the museum officially at the Thursday evening session by C. E. Westover, Burnside Steel Foundry Co., Chicago, chairman of the Chicago chapter, and chairman of the committee which sponsored the exhibit. The exhibit was accepted on behalf of the museum by Dr. Philip Fox, director of the Museum of Science and Industry. A description of the fine display and a list of the patrons will be presented in an early issue of THE FOUNDRY.

Hold Four Simultaneous Sessions

With a registration in excess of 500, the conference was a success in every way. The program and other details of the three-day meeting were arranged by a committee of the chapter and museum, with L. H. Rudesill, Griffin Wheel Co., Chicago, chairman, and Bruce L. Simpson, National Engineering Co., Chicago, secretary. Simultaneous sessions covering the four branches of the industry were held on Thursday and Friday, and on Saturday morning F. A. Melmoth, Detroit Steel Castings Co., Detroit, addressed over 300 students from the Chicago area on, "Modern Castings' Application to Engineering."

The banquet on Friday evening featured a fine talk by Henry S. Washburn, Plainville Castings Co., Plainville, Conn., and president of the A. F. A., and an interesting address by Col. Frank Knox, publisher of the *Chicago Daily News*, which dealt chiefly with the steps the United States must take to prevent incidents which might result in our entering another war. "Foundrymen," said Colonel Knox, "belong to one of the creative industries of the world. The men who work in that industry play a mighty important part in a world torn by war—a war fought by machines."

The Thursday evening session featured a paper prepared by Dr. H. W. Gillett and Dr. C. H. Lorig, Battelle Memorial institute, Columbus, O., and presented by Dr. Gillett. The paper, entitled, "Cupola Possibilities and Limitations for Making High Strength Iron," first described the results of several tests indicating possibilities of manipulation in producing low carbon irons in the cupola. He pointed out that it probably is not wise to overstep the sensible mean and try to force the base iron to too high a strength. The super-strength unalloyed irons have greater shrinkage, higher melting points, poorer castability, and offer more difficulty in obtaining sound castings.

Suggest Use of Briquets

In the second portion of the paper, Dr. Gillett discussed the use of briquetted borings in the cupola mix, and suggested group action in localities where feasible to make possible the production of briquetted borings and turnings. The economics of the practice was illustrated through prices for various types of ferrous scrap used in the foundry.

A discussion of "Casting Qualities as Related to Sand Conditioning," by Harry W. Dietert, Harry W. Dietert Co., Detroit, featured the first gray iron session at which Harold W. Johnson, Northwestern Foundry Co., Chicago, presided. Mr. Dietert outlined the seven stages through which a mold passes at the time of pouring and setting of the metal as follows: 1—Skin of mold dries giving off gases which must be vented; 2—Drying causes mold skin to set, attaining first a dry strength and as the temperature increases above 230 degrees Fahr., sand reaches a hot strength stage; 3—When heating skin of mold expands, placing molten metal in compression; 4—With sufficient heat the mold skin reaches a high temperature and contracts placing the face of the mold in tensile stress; 5—Skin of mold sinters or fuses with sufficient heat, causing sand to burn on the casting; 6—Skin of mold and core loses all or part of its hot strength when subjected to high temperatures; 7—Mold deforms, allowing contraction of the casting.

Sand Affects Physical Properties

The speaker then discussed the defects originating in the different stages. With the aid of slides he showed how sand affects fluidity, chill, strength and deflection of metals.

Thursday afternoon Carl H. Morken, Carondelet Foundry Co., St. Louis, presented an interesting paper before the gray iron group on, "Modern Gray Iron Melting Practice." Garnet P. Phillips, International Harvester Co., Chicago, was in the chair. Mr. Morken pointed out that interest in melting methods may arise from two causes, each important in itself, namely: 1—Purely a cost and efficiency of operation viewpoint, and 2—the desire to learn the technique of making different kinds of iron, such as high test irons, low carbon irons, alloyed irons, etc. He then summarized what is being done to improve what may be termed ordinary practice, and pointed to methods followed in producing high test iron.

Mr. Morken first discussed the cupola, which he stated, is still the cheapest of all melting units, both in initial cost and operating cost. In cupola melting the trend seems to be in the direction of sized coke, the 3 x 5 inch being the popular size. Use of pitch or petroleum coke is growing where small amounts,

such as a forkful or two per charge, aids in keeping the carbon up. Mr. Morken believes not enough attention is paid to securing a well lighted bed. The operator must be assured of a controlled amount of oxygen entering the cupola at a constant pressure.

The speaker then described the use of the air furnace, electric furnace and various combinations such as duplexing, triplexing, etc., in the melting of iron for castings. He also showed a number of interesting slides.

Friday morning the gray iron group inspected the museum. Two papers were presented in the afternoon, the first being, "The Role of the Common Alloys in Gray Iron Castings," by Armand DiGiulio, University of Detroit. L. F. Lottier, Peoples Gas, Light & Coke Co., Chicago, presided. Dr. DiGiulio presented an interesting discussion and a limited amount of data to show in a general way the outstanding effects of common alloy additions on gray iron. The alloys discussed included copper, nickel, titanium, chromium, molybdenum, and vanadium.

Many Variables are Involved

It was pointed out that the action of alloys in cast iron is shown either by their effect on the matrix of the iron or by their effect on the size, type, amount and distribution of the graphite flakes, or both. While results of alloy additions usually are evaluated by determining the physical properties of the iron, and determination of physical properties is essential, too much generalization cannot be undertaken, due to the many variables involved. Generally speaking, carbide forming elements have a pronounced effect on both tensile strength and brinell hardness, while solution forming elements are milder in action.

In the second paper, Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, discussed, "Uses of Phosphorus in Present Day Cast Iron." Dr. MacKenzie stated that phosphorus has very little effect on the strength properties in the ranges being considered, namely 0.20 to 0.60 per cent, but that phosphorus does develop certain beneficial effects in connection with the properties of wear and heat and corrosion resistance. The speaker discussed the use of high phosphorus irons in the automobile industry.

The first session on steel castings was devoted to a paper, "Nondestructive Testing," by C. W. Briggs, Steel Founders' Society of America, Cleveland. H. E. Orr, Burnside Steel Co., Chicago, was chairman. Mr. Briggs reviewed the history of x-ray and gamma ray examination of materials. He discussed the manner in which x-rays are generated and listed the types of equipment marketed today. Source of gamma rays was explained as well as the method in which radium decays.

Mr. Briggs discussed the general principles of shadow formation and exposure factors, and examined fully the reasons for radiographic examination, factors to consider in accepting orders specifying radiographic examinations, and radiographic standards. He outlined methods of using magnaflux, x-rays and gamma rays and gave consideration to sensitivity, contrast and other features of importance that are applicable to the three methods. The speaker stressed the technique of radiography and the safety measures that must be employed. Calculations of radiographic cost also were considered.

The steel group inspected the foundry exhibit and museum on Thursday afternoon. H. A. Forsberg, Continental Roll & Steel Foundry Co., East Chicago, Ind., presided at the Friday morning session at which Herbert Blosjo, Minneapolis Electric Steel Castings Co., Minneapolis, discussed, "The Effect of Aluminum on Cracking of Steel Castings When Unrestrained Shrinkage Is Permitted." It should be mentioned here that the title of that paper mentioned on page 46 of the November issue of THE FOUNDRY was incorrect, and that the editors regret the typographical error.

Castings Should Be Fed

Mr. Blosjo reported on an investigation carried out under free shrinkage conditions, which means the part was so made the mold did not tend to prevent linear contraction. Conclusions drawn from the investigation showed that defects obtained at internal corners of steel castings when improperly fed and when unrestrained shrinkage is permitted are purely shrink cavities. By feeding the section properly, these can be eliminated. The speaker also suggested that after conducting the investigation to its present point, the study should be changed to determine the effect of aluminum with restrained shrinkage. The defects so far examined may be eliminated by feeding the section.

The Friday afternoon session on steel castings featured a paper, "Final Deoxidation for Cast Steel," by Walter Crafts, Union Carbide & Carbon Research Laboratories, Niagara Falls, N. Y. B. J. Aamodt, National Malleable & Steel Castings Co., Chicago, presided. Mr. Crafts stated that research on the capacity of a great number of elements to reduce porosity in steel to which hydrogen had been deliberately added as well as in steel that tended to be porous without special treatment, has shown that degasifying elements suitable for general application are limited to aluminum, zirconium, titanium, and calcium.

A survey of the nonmetallic inclusions controlling ductility has confirmed the fact that it is necessary to add either a very small or a fairly large amount, but not an intermediate amount of the strong deoxidizers. Reliable results have been obtained when 2 to 4 pounds per ton of calcium-manganese-silicon have been added along with 0.10 to 0.20 per cent of aluminum, titanium, or zirconium. In steels of less than 0.40 per cent sulphur, better ductility has resulted from treatment with calcium, and either aluminum or titanium.

In steels of more than 0.040 per cent sulphur the calcium-zirconium combination has given better results. Although no quantitative estimates have been made, the effects of chemical composition and degree of initial deoxidation on the character of the inclusions and the resulting ductility have been indicated qualitatively. A high degree of freedom from hot tearing of steel castings during solidification also has been found to result from the use of the deoxidizing combination of aluminum or zirconium with calcium.

Outlined Early Problems

Two papers were presented at the first malleable session on Thursday morning under the chairmanship of L. F. Hartwig, Chicago Malleable Castings Co., Chicago. In a paper on, "Duplexing from the Operator's Viewpoint," C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill., first outlined briefly the early problems of the process and then discussed in detail the practice followed at his plant. Metal is melted in a 90-inch cupola lined down to 60 inches, with air supplied by a positive pressure blower. Air furnace is oil-fired using preheated air at about 600 degrees Fahr.

Charge in the cupola consists approximately of 16 per cent pig iron, 30 per cent steel, 47 per cent sprue and 7 per cent malleable scrap. Silvery and high silicon-high manganese pig iron are used. An effort is made to bring the iron from the cupola to the furnace with an analysis as nearly correct as possible, with the exception of carbon which is always high and is reduced in the air furnace to the proper analysis. Four heats a day are secured, the first and third heats being poured into light sections and the second and fourth heats into heavier sections, the latter running about 1-inch. Mr. Lawson then outlined the analysis of iron secured from the various heats, and stated the temperature of the iron leaving

(*Concluded on page* 70)

BOOST SPEED...SAVE TIME

in Rough Grinding

YOU CAN step-up wheel speeds and cut more metal per minute by switching to Bakelite resinoid bonded abrasive wheels. Tougher, stronger, these wheels are approved for faster operation...up to 9,500 s.f.p.m. for snagging, or 16,000 s.f.p.m. for cut-off. Even-wearing, free-cutting and cool-running, they also save wheel-dressing time. Write for informative booklet 15G, "High Speed Abrasive Wheels".

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.
CHICAGO: 43 East Ohio Street. BAKELITE CORPORATION OF CANADA, LTD., 163 Dufferin Street, Toronto, Ont.
West Coast..Electrical Specialty Co., Inc., Los Angeles, San Francisco and Seattle

BAKELITE

The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, an unlimited quantity, it symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

BONDED WHEELS

(*Concluded from page* 68)

the furnace is from 2800 to 2850 degrees Fahr.

F. C. Scheiber, Whiting Corp., Harvey, Ill., in the second paper, "Duplexing and Its Various Ramifications," discussed the history of the process and the progress which has been made since its introduction. Control of product, economy, and continuous operation were cited as features of the process. Mr. Scheiber stated that the pioneers in the use of the process encountered difficulties in reducing carbon properly, but progress in the practice has eliminated that difficulty and now the carbons are under complete control, ranging between 2.40 to 2.50 per cent. In the duplexing process the sulphur is slightly on the high side, but this is compensated for by using a little more manganese. Due to the slightly higher sulphur it is necessary to carry the anneal to a little higher temperature and to extend the cycle somewhat.

Describes Short Cycle Anneal

G. B. Stantial, Illinois Malleable Iron Co., Chicago, presided at the Thursday afternoon malleable session, where two papers on, "Modern Annealing Methods and Metallurgy," were presented. John Jans, Holcroft & Co., Detroit, stated that the necessity for lowering annealing costs, improving uniformity of product and meeting the demand for quicker deliveries has brought about modern annealing methods and metallurgical changes in malleable iron. He discussed the various stages in the annealing process and then described the furnaces designed to produce iron on shorter cycles. Mr. Jans also considered the types of fuels available for production annealing units.

In conclusion he stated that the physicals of the short cycle iron are higher in tensile and yield than the average iron annealed in the conventional type furnaces. In elongation the conventional type ovens show a higher figure, although short cycle malleable iron consistently will show elongation of from 15 to 18 per cent, will machine well, bend well and stand up well under impact. In his opinion, uniformity of annealing results is in favor of iron annealed in continuous short cycle furnaces, as both heating and cooling are applied from top and bottom in a comparatively shallow, flat load.

Ray Flansburg, Belle City Malleable Iron Co., Racine, Wis., discussed the factors which must be considered in selecting the type of oven and annealing cycle. He pointed out that the individual problems of each plant must be considered thoroughly when weighing the advisability of any type of annealing equipment. Mr. Flansburg also discussed the effect of reducing the annealing cycle on maximum thickness of section, and size of the casting and the importance of hard iron control and then showed a chart incorporating the factors which must be considered before making the decision on annealing equipment.

On Friday the Malleable Founders' society held two shop practice meetings in connection with the conference with all visitors invited. James H. Lansing of the society, in discussing, "Finishing of Malleable Castings," pointed out that as applied to casting surface and the influence of mold permeability, the terms smooth, medium and rough necessarily are relative. Castings may be produced in a sand of 60 permeability which have too rough a surface, while others produced with a sand with considerably higher permeability may have a surface satisfactory for the purpose intended.

Mr. Lansing pointed out that when a small amount of metal is to be removed, the difference between high speed and low speed grinding is not important. When any considerable amount of metal is to be removed, the wheel contact time becomes important and considerable saving can be effected by the use of high speed grinding stands and wheels. He presented data to indicate the savings possible in the use of two types of wheels.

Clean Malleable Castings

The shop practice meeting was continued in the afternoon, with a discussion of the subject of finish by Enrique Touceda of the Malleable Founders' society. Professor Touceda discussed the influence of surface conditions in failure by fatigue; surface defects caused by mold gases or by ill conditioned sand and facing defects due to chipping; surface defects occasioned by spruing and the removal of gates by grinding, shearing or milling; cleaning of malleable castings; surface defects due to scaling; effect of surface difficulties on machinability; coining; straightening; dimensional tolerances; and welding. He pointed out in conclusion that year by year, the demand on the foundry in respect to finish has become more and more exacting.

The first nonferrous session under the direction of G. P. Halliwell, H. Kramer & Co., Chicago, was spent for the most part in a discussion of aluminum alloy foundry problems by H. J. Rowe, Aluminum Co. of America, Cleveland. To stimulate discussion, the speaker first presented a short resume of the inherent characteristics of aluminum alloys and how such characteristics affected the foundry practices. Following this introduction, the meeting was thrown open to a general discussion from the meeting floor.

The speaker touched on such practices as melting, fluxing and pouring, mentioning the various precautions that should be exercised in each phase of the process. The problem of gating was mentioned, and how, even though this must be considered a part of the art developed by experience, a knowledge of characteristics of the various alloys makes a good guide. Such factors as melting speed, metal handling, and pouring height, factors not generally given a great deal of thought in the foundry, also came up for comment.

The discussion following the introductory remarks dealt with such matters as gas absorption and how it would be minimized; surface discoloration of castings; and the effect of high metal temperature. Some interesting comments with respect to how much problems may be handled practically, were offered.

Produce Nickel Silver Castings

D. M. Curry, International Nickel Co., Detroit, presented a paper, "Discussion of Nickel Silver Alloys," at the afternoon session, with H. M. St. John, Crane Co., Chicago, presiding. Mr. Curry pointed out that nickel silver castings can be produced readily in the foundry, providing one or two facts of a fundamental nature are understood fully. All nonferrous alloys containing appreciable quantities of nickel are susceptible to gas absorption during melting, particularly so far as hydrogen is concerned, and accordingly precautions must be taken during founding to minimize that action by rapid melting in slightly an oxidizing atmosphere. Also proper consideration must be given to the problems of composition, deoxidation treatment, pouring temperature and molding methods. Mr. Curry then discussed in some detail the factors relating to composition, melting, molding and pouring.

A discussion of "Brass and Bronze Alloys," by C. V. Nass, Fairbanks, Morse & Co., Beloit, Wis., featured the final nonferrous session, at which W. Romanoff, H. Kramer Co., Chicago, presided. Mr. Nass took as an illustration a casting which had been found defective in the machine shop, and then discussed the various factors which must be considered in making a correct diagnosis of the cause of the trouble. He indicated a need for determining the history of the casting when previously in the foundry, and the factors to be considered in the present instance, including molding, metal analysis, melting, etc. He then presented an interesting discussion on gating nonferrous alloys. Basic principles remain the same in all cases, but various minor features must be changed.

GREETINGS

to the
Foundry Industry
from

GLOBE IRON COMPANY
JACKSON, O.

PROMOTING GOOD WILL BETWEEN FOUNDRYMEN and their CUSTOMERS

It has been our unusual pleasure and privilege for over three quarters of a century to extend greetings to foundrymen, thanking them at this season of the year for their valued and continued patronage. The best "gift" within our power to give is, as it has been for so many years, the high quality of Globe Silvery Irons made with an all-ore burden completely free from scrap additions. Good will between foundries and their customers is one of the many invaluable ingredients present in every ton of Globe Silvery. We extend best wishes to all foundrymen for a more prosperous, successful 1940 during which we will welcome the opportunity to be of service.

Central New York

OVER 75 members and guests were present at the first Fall meeting of the Central New York chapter of the A.F.A. held Oct. 13 at the Onondaga hotel, Syracuse, N. Y. Fred G. Sefing, International Nickel Co. presented the first of a series of four lectures on "Metallurgy of Cast Iron," and gave to each member and guest present complete notes on the first lecture. This made it possible to follow the lecture closely and the notes can be used for reference and study later. In addition, the program committee acquired two projecting microscopes to aid the members in following the lecture by visual inspection of sample specimens.

The first lecture was accorded an enthusiastic reception and the officers of the chapter believe many more foundrymen of the district will be present at the second lecture.

After the lecture a quiz session was held and many questions were asked by those present. H. H. Judson, Goulds Pumps Inc., and chairman of the chapter asked that members having questions may write them out and deposit them in the question box provided for the purpose. Mr. Judson also announced that a nonferrous speaker would be obtained in conjunction with Mr. Sefing for the benefit of the nonferrous members of the chapter. Max Gansauge, Goulds Pumps nonferrous department, was appointed chairman of the nonferrous group to arrange for the speaker.—*L. D. Wright, secretary.*

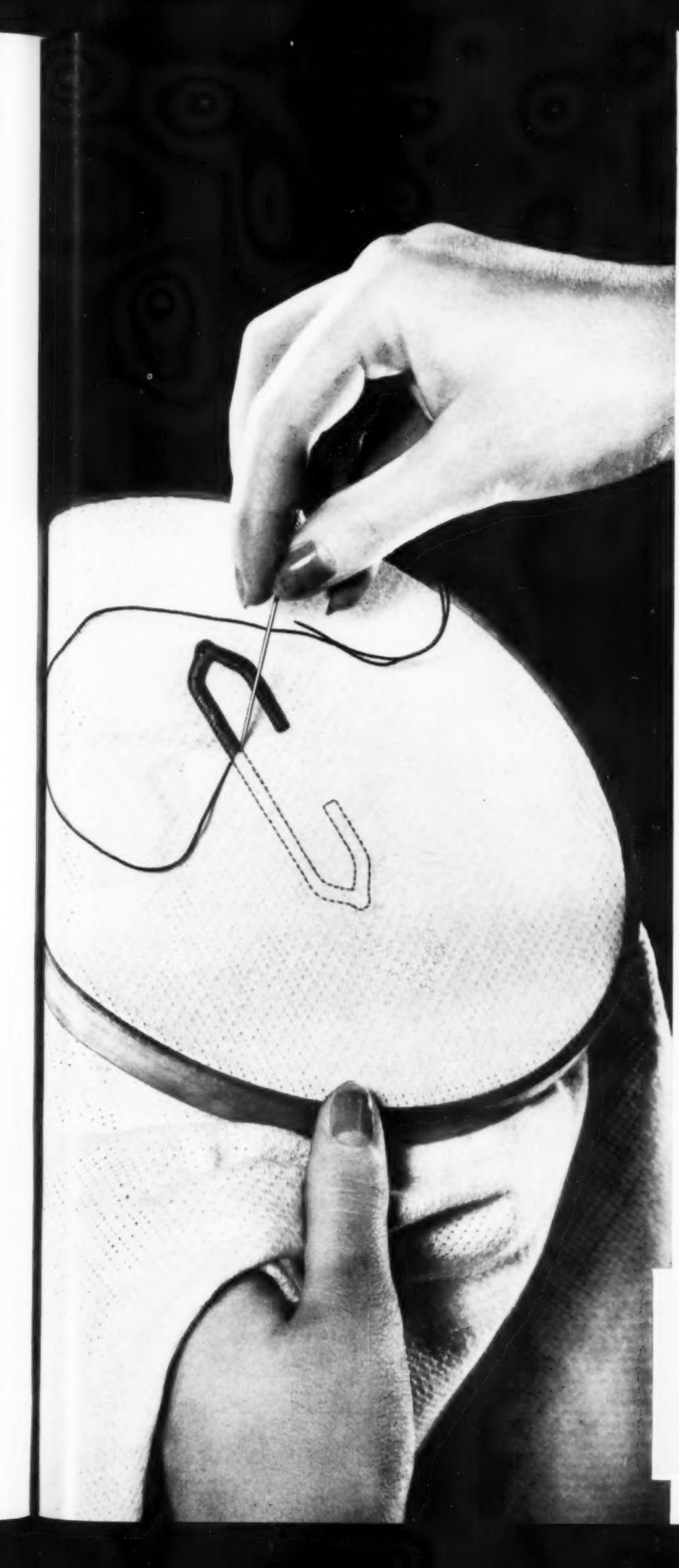
Wisconsin

APPROXIMATELY 130 members and guests attended the meeting of the Wisconsin chapter in the Schroeder hotel, Milwaukee, Oct. 20. A short coffee talk on "Highways of the Air," by Capt. B. C. Richards, United Air Lines, was followed by a highly interesting paper entitled "How Do You Sell Your Castings," presented by W. W. Rose, executive vice president, Gray Iron Founder's society, with head office, Cleveland.

The first part of the paper by Mr. Rose was devoted to a general discussion of selling methods as applied to various commodities under all possible conditions. When grouped under three general heads, industry and commerce have found that specific methods must be applied in each division even though the basic principle remains the same, that is the desire of ownership either permanent or temporary on the part of the customer. The problem of selling castings is complicated by a great many factors, some trivial, some of formidable proportions, but all entering into the general solution of the problem. He instanced as one of the pitfalls, the case of a small shop devoted exclusively to the production of castings for an automotive plant. When the management of the auto plant decided to erect and operate a foundry the small foundry was wiped out. The entire talk was illustrated by interesting descriptions of incidents within his

(*Continued on page* 75)

Regional conference committee of the Wisconsin chapter gathers to make plans and arrangements for its forthcoming 1940 meeting which will be held in Milwaukee



☆

How to Streamline a Needle

☆

Problem: Every woman knows how hard it would be to sew if needles didn't have sharp points and highly polished surfaces. But how can manufacturers put such a finish on these tiny slivers of steel…and sell them for a few cents a package?

Answer: Streamlining a needle has become a commonplace low-cost production process, thanks to the genius of abrasive engineers and the adaptability of abrasive products such as produced by Carborundum.

The wire from which needles are made is cut into double lengths, two needles being formed from each piece. The wires are fed twice between fine grit grinding wheels, a delicate point being formed on one end at each pass. Then the eyes are punched and the two needles are broken apart, straightened and heat treated.

For the polishing, thousands of needles are wrapped in heavy moistened canvas packets containing extremely fine grit Abrasive Powder produced by Carborundum. The packets are rolled over and over, back and forth on flat tables for a period of two weeks, covering in their movements a distance of over thirty miles. When they are opened we have the finely polished, delicately pointed, rust resisting needles which are a commonplace in every household.

AN INVITATION TO EXECUTIVES CONCERNED WITH MANUFACTURING

Whatever you make, there are two ways in which The Carborundum Company's Abrasive Service can help your company. Highly trained abrasive engineers are ready to help solve any special grinding or finishing problem that may confront you. Also, without obligation, they will study your present abrasive set-up, report on its efficiency, and wherever possible, indicate how production can be improved or savings effected. Write to The Carborundum Company, Niagara Falls, N. Y. and a representative will call.

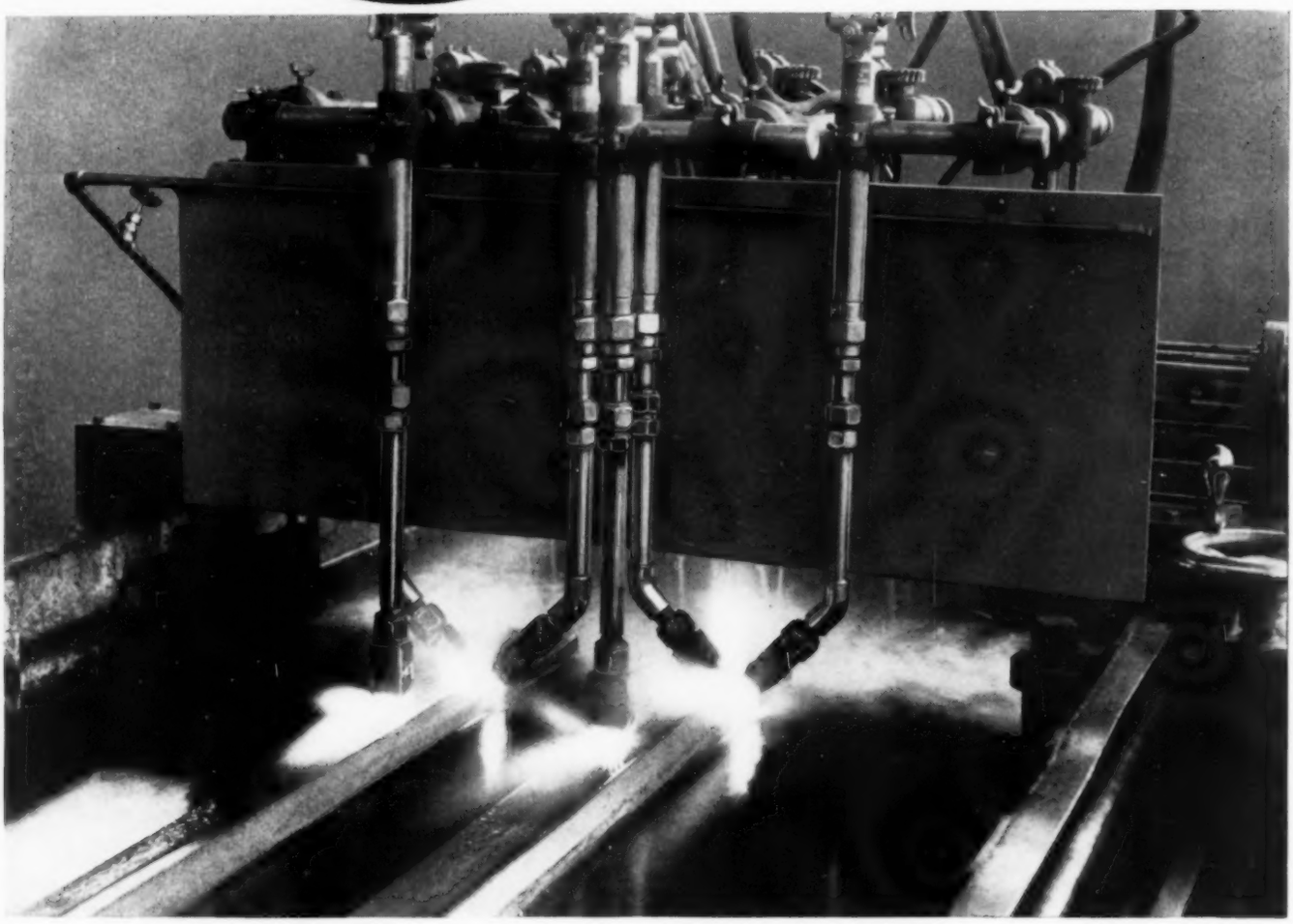
CARBORUNDUM

REG. U.S. PAT. OFF. BRAND

ABRASIVE PRODUCTS

FOR ACCURACY AND ECONOMY IN MANUFACTURE

STEEL CASTINGS WEAR LONGER when AIRCO Flame Hardened



Airco Oxyacetylene Flame Hardening this cast lathe bed enabled the Monarch Machine Tool Company, Sidney, Ohio, to solve the problem of bed wear permanently. As a result, Monarch Lathes now last longer; need fewer repairs.

The grain structure of the entire flame hardened area is greatly refined and condensed. This is accomplished without materially affecting the physical properties of the core metal. Thus, flame hardened castings retain their original toughness and have the added quality of providing surfaces capable of withstanding severe wear. » » » The facilities of Airco's Applied Engineering Department are available to assist Airco customers solve problems involving surface wear. Write for full details.

AIR REDUCTION

SALES COMPANY

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y., DISTRICT OFFICES IN PRINCIPAL CITIES

AIRCO *Anything and Everything for* GAS WELDING or CUTTING and ARC WELDING WILSON

(*Continued from page* 72)

personal experience which has been exceptionally wide and varied in this and foreign countries.

According to the speaker the foundry catering to a severely restricted market must be equipped for economical operation, exercise economy and maintain research adequate to insure keeping up with the procession. It must guard against service failures. A precarious existence faces the plant where cost and simplicity restrict the market through transportation charges. The market may move away or evaporate. The operator is the victim of severe price competition if he has foundry neighbors. He had best look toward extending his knowledge and equipping his plant to handle a different product. He has little future unless he enjoys a local monopoly.

Mr. Rose quoted figures to show the magnitude of the foundry industry in this country and to prove that it is increasing in every respect from year to year. Figures for the past year are not available, but the total foundry sales for 1935 were $458,631,675. In 1936 the business was represented by $613,872,421. Sales figures for 1937 were $757,287,972.

The speaker concluded his presentation with an argument favoring selling castings by the piece instead of by the pound, and a general description of salesman qualifications and how to develop young men in that field.

The conference committee of the Wisconsin chapter of the A.F.A. met recently to begin plans for the chapter's annual regional conference. Members of the committee are as follows: B. D. Claffey, chairman, Prof. E. R. Shorey, co-chairman, R. J. Anderson, C. A. Gutenkunst, W. A. Hambley, Howard Waldron, E. C. Silver, P. W. Power, Prof. J. E. Oesterle, O. F. Patzke, Walter Gerlinger, R. M. Jacobs, A. C. Ziebell, M. J. Carpenter, Walter Edens, John Bing and William J. MacNeill.

Northern California

NORTHERN California Chapter of the A. F. A. held its annual golf party and dinner at the Sequoyah country club in Oakland, Calif., on Friday, Oct. 13. Approximately 62 members attended and those playing golf enjoyed a wonderful day competing for four handsome golf trophies. Five door prizes also were awarded, which added interest to the evening of speech making and story telling.

S. D. Russell, chairman of the chapter spoke of the real intent of getting foundrymen together in the spirit of play, that they might be better able to work together for the benefit of all concerned. Charles S. Knight, director, industrial division of the California state chamber of commerce was present to report progress on the Fifteenth annual steel conference to be held at Del Monte Feb. 8 and 9, 1940, and featuring the foundry industry. Mr. Knight stated that Henry S. Washburn, president of the A. F. A. would be one of the principal speakers at the conference and would be accompanied on his Western tour by C. E. Hoyt, executive vice president of the association as well as several other officers and their wives. These officers of the A. F. A. will take advantage of the first trip to the Coast to get acquainted with the two chapters in California.—*George L. Kennard, secretary, treasurer.*

Ontario

ABOUT 100 members and guests attended the first regular meeting of the Ontario Chapter held at Rock Garden lodge, Hamilton, Oct. 27. Chairman D. J. McDonald, Dominion Radiator & Boiler Co., Ltd., Toronto, presided over a program which included special entertainment and an excellent short symposium on the production of air brake castings under the leadership of John Reid, superintendent of foundries, Canadian Westinghouse Co., Ltd., Hamilton.

Following a brief introduction of the subject, Mr. Reid introduced four members of his staff—patternmaker, core maker, molder and inspector — who, in turn, described their own particular share in the production of air brake castings while placing emphasis upon the inter-departmental co-operation that is so essential to the most efficient foundry production.

When the requirements for a new casting come in from the engineering department, the chief patternmaker and members of the foundry staff discuss the whole problem thoroughly before the layout is made. Careful attention to layouts simplifies all succeeding operations and complete knowledge of the job in hand enables the patternmaker to save upon inconsequential details whose importance he could not judge properly if working from a drawing alone.

Production of a pattern is followed by the making of a sample casting which is sent to the air brake engineer for inspection, carefully checked for location of center lines, and is cut up to assure the foundry that correct thicknesses exist in all sections.

Core set-up for certain air brake castings are exceedingly complex with a single set-up comprising as many as 48 individual cores. Cost of such a core set-up is considerable under the most favorable conditions and some standardization method is essential. On one core set-up job 10 men are employed working to a schedule which aids greatly in the production of uniform set-up. Proper gating procedure has overcome any small difficulties experienced in keeping dirt out of the metal and changes in pouring methods have usually sufficed to remedy any other difficulties experienced in casting production.

To carry through his job effectively, the inspector keeps in close touch with engineering, machine shop and foundry departments. The stand which must be taken by the inspection department is that the customer knows what he wants but if his demands are unreasonable, an attempt must be made to get the customer to see the foundry's point of view.

A certain amount of inspection is carried out before machining. Then castings are tested for air tightness from port to port. When persistent trouble occurs, castings may be cut partly through and broken at the point where the trouble is believed to be. By this means it is possible to analyze most of the causes encountered very quickly and arrive at satisfactory solutions. —*Joseph Sully, director.*

New York-New Jersey

TOPIC of discussion at the November meeting of the Metropolitan N. Y.-N. J. Chapter of the A.F.A. held Nov. 6 at the Essex house, Newark, N. J. was, "Wear of Cast Iron." R. J. Allen, Worthington Pump & Machinery Co., technical chairman of the chapter, introduced the speaker, Paul S. Lane, American Hammered Piston Ring division, Koppers Co., Baltimore. Approximately 80 members and guests were present.

Mr. Lane stated that although wear has been defined as, "an undesirable change in dimension under service," there are instances in which wear is desirable, and cited piston ring applications as a case in point. Hardness, strength and other common properties of cast iron give no reliable indication of its wear resistance, and although microscopic examination has shed some light on the problem, the safest method of determining whether or not a particular iron will give the satisfactory wear performance is to actually subject it to a wear test.

Data obtained from tests have established certain fundamental requisites for good wear resistance.

Graphite form and distribution are vital considerations. Dendritic type graphite with associated free ferrite is certain to produce scuffing while normally distributed fine flake graphite generally gives best results. Presence of moderate amounts of phosphorus as steadite, and sulphur as manganse sulphide, have proved to be beneficial to wear resistance probably because the introduction of added phases tends to confer upon the iron the qualities of bearing metals. Small quantities of free carbide may be helpful, but large proportions produce scoring. Mr. Lane presented data to show that heat treatment reduces the weight loss of cast iron, but at the same time increases scuffing of the other wearing surface. In many instances combinations of alloys have had a beneficial effect on wear performance. Alloying to high hardnesses produces much the same effect as heat treating in that the wear loss is reduced but scuffing is increased. In the final analysis the problem of securing satisfactory wear resistance is one of compromising the weight loss of the iron with its scoring or scuffing effect on the other wearing surface. A discussion centering on the technique of wear testing followed the excellent talk.

Earlier in the evening, the dinner guests were treated to an excellent coffee talk on snakes and their habits with the speaker, R. W. Thorne, Bennett Insured Steel Treating Co., fascinating his audience by displaying a collection of live reptiles.

W. E. Day Jr., chairman of the chapter, announced that Carl Wheeler, vice president, American Steel Castings Co., will be speaker for the Dec. 4 meeting of the chapter. His subject will be, "How Design Factors Affect Steel Castings."—*K. A. DeLonge, assistant secretary.*

Detroit

LIKENING castings to the "staff of industrial life," much as bread is the staff of life, Rex W. Jennings, general superintendent, John Deere Tractor Co., Waterloo, Iowa, urged his 100 listeners at the October meeting of the Detroit chapter of the A.F.A. to "make 'em better and make 'em cheaper."

It was Mr. Jennings' third appearance in recent years before the Detroit group, and marked an auspicious opening of the 1939-40 season for the chapter. The meeting place has been changed to Huyler's L'Aiglon in the Fisher building, and those on hand for dinner all seemed to favor the new location.

In the absence of Harry W. Dietert, chapter chairman, Mr. Jennings was introduced by Fred J. Walls, International Nickel Co., and a chapter director. The speaker detailed a number of the operations in molding and patternmaking divisions of his plant and pointed out that molding is the key operation to the entire foundry, all other phases being geared to give proper service to the molder.

With respect to choice and use of molding machines, he said that accuracy and sturdiness of foundry equipment are being improved to the point where the precision of machine tools is being approached. Former repair gangs have had to be trained to be equipment or maintenance gangs whose function is to keep equipment going and abreast of production schedules, rather than to repair it in case of breakdowns.

Some rather remarkable molding speeds are achieved in Mr. Jennings' plant, all work being piecework. As measuring sticks applied to operators, a 400-class has been set up. For example, on a job requiring two men and involving cope and drag, if the average production is 15 molds per man per hour, then they are in the 400-class, in view of production of 480 pieces per 8-hour day. This level is used to promote production rates.

Work in this plant is changing constantly, and an average week will see about 400 patterns in use, with daily production running sometimes as high as 35,000 pieces. The idea of quick change is fostered and the foundry keeps close to the shop in production to avoid building up too-heavy inventories. In debating the advisability of installation of new equipment, Mr. Jennings said his organization considered that the average investment per man in molding equipment is $5000-$10,000, a figure which is in force whether the equipment is operating or not.

One innovation in the Iowa plant is the setting of piecework rates by the men themselves. All time studies are made known to the operators, and in fact the operator in question is required to sign the time study of his operation. The plant produces about 45,000 tons of single-base iron castings in a year, with a 71 per cent yield. Four cupolas lined to 72 inches are available, two being operated at a time. Largest casting weighs better than 800 pounds, and output includes wheels, cylinder blocks, transmission cases and a wide range of smaller parts.

In surveying general problems confronting the foundry industry, Mr. Jennings said in his opinion the foundry industry is a young industry with ample possibilities for future profit. One need is for more adequate standards for the guidance of the smaller operating units. He suggested the A.F.A. consider setting up some sort of "bureau of standards" through which such information and data could clear for the benefit of all.

Mr. Walls announced the appointment of Anthony Guenther, core room superintendent, foundry department, Dodge division, Chrysler Corp., as a director of the local group to fill the unexpired term of J. H. Crawley, now located in St. Catherines, Ont.—*A. H. Allen.*

New England

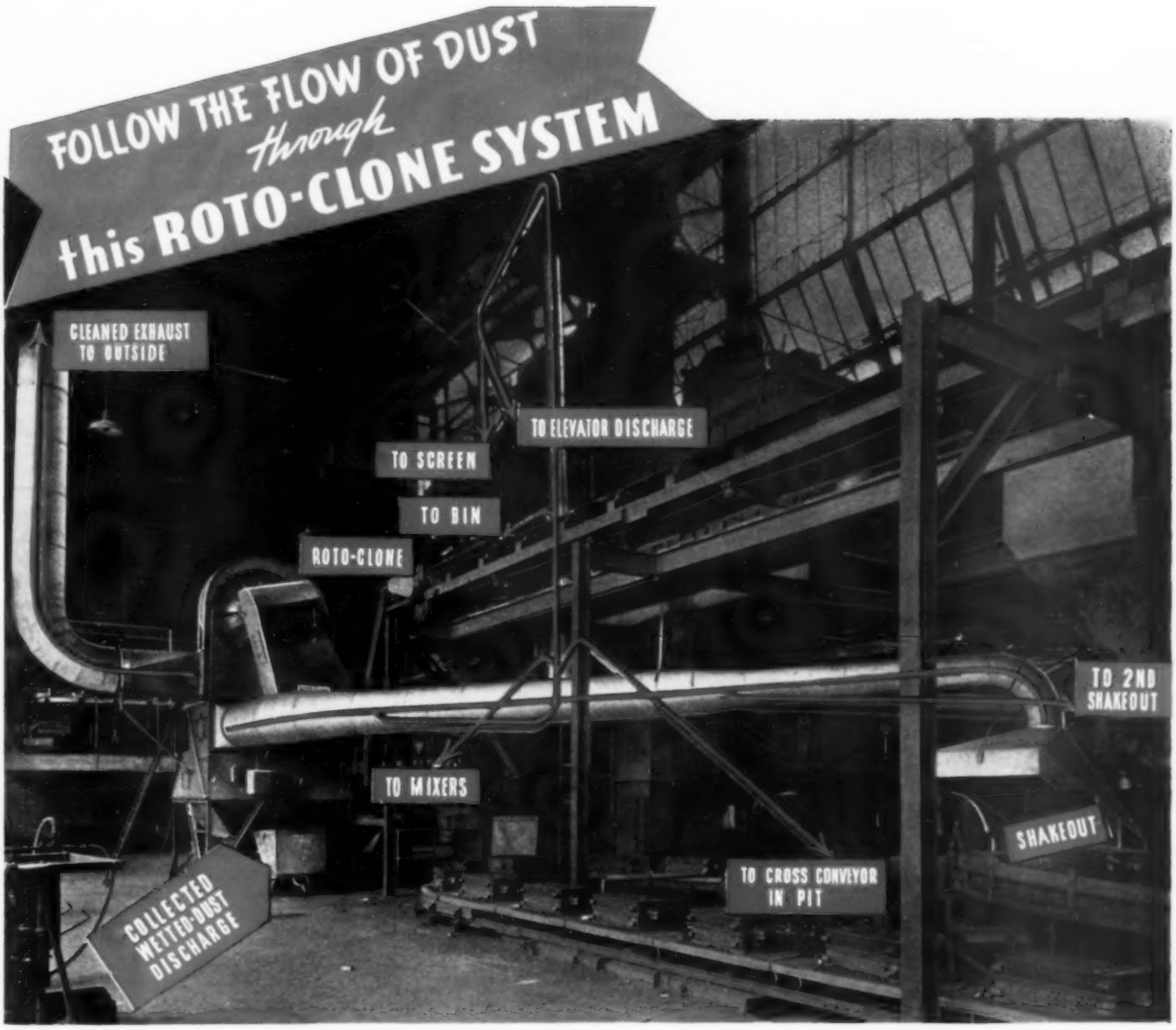
REGULAR meeting of the New England Foundrymen's association was held at the Engineers' club, Boston, Oct. 11. About fifty members and guests attended to hear an address by Edmund J. Lowry, Woonsocket Color & Chemical Co., on, "Russia Reconnoiters." Mr. Lowry formerly was consulting metallurgist for one of the country's large pig iron concerns and has been active in the A.F.A., serving on several technical committees, before leaving in 1930 to work in a consulting capacity in Russia. He applied for a visa to return to the United States on Feb. 1, 1937, and did not receive it until Nov. 6, 1937, then was detained for a period of 30 days at the border because he had a few blue prints of molding machines.

After explaining briefly to the audience what the Russian 5-year plan was supposed to accomplish, Mr. Lowry described the Russian people as being clever and quick to learn. It has been necessary to operate an American designed plant for production of tractors, automobiles, etc., by unskilled and inexperienced workers. That resulted in almost every case of inefficiency because workers were incapable of keeping up with the production for which the plant was designed. Russia has 22 of the 28 minerals necessary for war material production as well as plenty of gold. Considerable of it is mined but for government use only.

No private property is available as everything is owned by the government, even automobiles. Russia now is occupied in assembling motors and planes from parts manufactured in other countries rather than manufacturing them. Lack of mechanical knowledge is self-evident. Communism of Russia according to Mr. Lowry, is in reality government controlled capitalism with personal liberties greatly limited or entirely erased.

Guest at the dinner preceding the address was Dr. William Barr, Oma-

(*Continued on page* 78)



THIS TYPICAL ROTO-CLONE SYSTEM EXHAUSTS TWO SHAKEOUTS AND THE SAND-HANDLING EQUIPMENT IN A LARGE AUTOMOTIVE FOUNDRY

The Type W Roto-Clone is a single compact self-contained unit designed to exhaust dust from *every* Foundry operation. It may be conveniently located—often in unused overhead space. Eliminates fans, pumps, tanks or other auxiliary equipment. Because the Roto-Clone exhausts a constant air volume uniform fines control is assured.

AAF Engineers have compiled a wealth of information on the control of Foundry dust that is available without obligation. Write for Bulletin No. 276.

AMERICAN AIR FILTER CO., INC.
Incorporated
220 Central Ave., Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

ROTO-CLONE
WATER SPRAY
DYNAMIC PRECIPITATOR

AIR FILTRATION AAF DUST CONTROL

(*Continued from page* 76)

ha, Nebr., chief chemist and metallurgist, Union Pacific railroad. He was introduced by R. F. Harrington, Hunt-Spiller Mfg. Corp., and spoke briefly of his work.

Regular monthly meeting of the New England Foundrymen's association was held at the Engineers' club, Boston on Nov. 8 with Vice President Francis LeBaron presiding. Following the dinner motion pictures of the visit to the Mystic Iron Works by the group were shown through courtesy of the New England Coke Co. Main speaker of the evening was T. C. Weiser, Griffin Wheel Co., Chelsea, Mass., who presented first a motion picture entitled, "The Story of the Chilled Car Wheel," which was followed by an extremely interesting question period.

Mr. Weiser said that in his plant one wheel is poured per minute. The core which forms the hub must be made carefully and set. It is removed mechanically after the shakeout, and the wheel is ready for annealing. Three days are required for cooling below the critical temperature, and one day to room temperature. A chill forms the chilled tread, and it is used only once a day. Its life is approximately 200 wheels. The chill is about 4½ inches thick, and remains in contact with a 700-pound wheel for 38 minutes. Metal patterns generally are used to eliminate some difficulties encountered with wood patterns.

Rapid pouring is a requisite for eliminating chill checks on the tread. After pouring the wheel is removed immediately to the annealing oven or soaking pit. Accurate temperature control of melting and pouring with an optical pyrometer, regular physical inspection, close chemical control, rigid physical tests under a 250-pound drop hammer are some of the factors which are involved in the manufacture of modern chilled car wheels. They are guaranteed for 7 years and average better than 100,000 miles per wheel.—*M. A. Hosmer.*

Birmingham

PRACTICAL talks by local and out of town foundrymen featured the first Fall meeting of the Birmingham District Chapter of the A.F.A., held at the Tutwiler hotel on Friday, Oct. 13. Total attendance was 145. The first speaker on the program was W. D. Moore, president, American Cast Iron Pipe Co., who was introduced by W. Carson Adams. Mr. Moore spoke of the progress made by the Southern foundrymen within the past few years.

W. E. Jones, Stockham Pipe Fittings Co., spoke on cupola malleable iron for pipe fittings, and J. M. Hutcheson, foundry superintendent, Birmingham Stove & Range Co. talked about stove plate foundry practice. Arthur Smith, Hardie-Tynes Mfg. Co. gave a talk on molding of heavy castings, while J. E. Cardwell, Lee Bros. Foundry Co., Anniston, Ala., discussed nonferrous foundry practice. The officers of the chapter wish to congratulate the speakers on the fine manner in which their subjects were covered. —*Farrar Hill, chairman, publicity committee.*

Philadelphia

ABOUT 100 members and guests dined at the opening meeting of the 1939-40 season of the Metropolitan Philadelphia Chapter of A.F.A. on Oct. 13, at the Engineers' club, Philadelphia. Lee Harris, Olney Foundry Co., introduced Dr. Hobart A. Reimann, professor of Medicine at Jefferson hospital, Philadelphia who discussed, "Occupation and Disease."

William C. Hartmann, Bethlehem Steel Co., newly elected chairman of the chapter, called the technical meeting to order with 150 present. The speaker, Emile Pragoff, chemist at the experimental station of the Hercules Powder Co., Wilmington, Del., spoke on, "Properties of Resin Bonded Cores." Mr. Pragoff pointed out that cores for foundry use are made with a wide variety of binding materials. Intelligent and economical use of these binders require a knowledge of factors affecting efficiency. Most commonly used resin in foundry practice is that obtained from the long-leaf pine trees of the South. Many foundries are familiar with resin, both used as such and in the form of core oil. Recent development has made available for foundry use a higher melting pine wood resin.

Effect of the following variables in core making process was discussed: Binder concentration, degree of pulverization of binder; baking conditions, temperatures and time; moisture content; mixing conditions; addition of silica flour; effect of other binders such as cereals, oil, etc.; effect of reclaimed sand; storage of baked cores prior to use.

Results obtained show that resinous binders increase in efficiency the finer they are ground and that with proper mixing and baking at temperatures ranging from 300 to 500 degrees Fahr. strength and core hardness may be varied at will by regulating binder concentration, moisture content of the core mix and length of baking time. Cores made from resinous binders exhibit unusual resistance to loss of strength in storage according to the speaker. Resin bonded cores are particularly adapted for use where high collapsibility is desired. Castings up to 1½ inches in metal thickness may be cast satisfactorily against resin bonded cores. Greater metal thickness castings usually call for combinations of resin binders with other core binders. Mr. Pragoff explained tests made on use of reclaimed sand in the making of cores. His records indicate that better results are obtained when the new and reclaimed sand used is of the same grain size, and when this was possible a larger percentage of reclaimed sand can be used without reducing the quality of the core. In no case, Mr. Pragoff pointed out, should reclaimed sand be used in excess of 65 per cent of the mix. Charts shown also indicate that equal parts of resin and silica flour gave better results than when used in higher percentages of either material. It was also pointed out that all binders act differently and that no one binder will do satisfactorily a job on all cores, but that many cores with a balanced amount of various kinds of binders would show a distinct advance.—*J. T. Fegley, chairman, publicity committee.*

Pittsburgh

FEATURED by an entertaining motion picture on sports and an excellent discussion of new developments in iron and steel foundry practice by R. C. Good, Electro Metallurgical Sales Corp., Pittsburgh, and a member of the organization, the October meeting of the Pittsburgh Foundrymen's association held the interest of approximately 85 members and guests.

The meeting was conducted by J. H. Johnston, Westinghouse Electric & Mfg. Co., and president of the association. Reports of standing committees and of the foundry fund trustees were heard prior to the paper. By means of slides Mr. Good showed the effects of various agents used as graphitizers in gray iron castings. Elimination of coarse graphite has been accomplished by a wide range of materials, including such agents as the CMSZ alloy, chromium and other agents. In addition to the elimination of coarse graphite, however, most of these agents have other effects on castings and must be watched carefully to prevent softening of the iron, increasing the chilling tendency, and the like.

The speaker demonstrated several examples of microstructure with addition of varying amounts of chromium, which was used to increase combined carbon, thus minimizing the eutectic, ferrite-graphite. Mr.

(*Continued on page* 80)

After many months of development . . .
HERE IT IS!

THE ADAMS POST TYPE JOLT SQUEEZER 10″ CYLINDER

Yes, it's a good looking machine, but it has much more than mere eye appeal. It has speed, power, stamina, combined with a simple design that effectively aids the molder to attain high output with minimum effort.

Plenty of important features, too . . . . time-saving features, safety features, and features which contribute to greater flexibility and lower maintenance. These and many more salient points are fully described in our circular No. C-703, which is yours for the asking.

In addition to the portable machine illustrated, a stationary type is also available.

Established 1883

THE ADAMS COMPANY

700 Foster Street

DUBUQUE, IOWA

(*Continued from page* 78)

Good also presented slides showing the dense casting structure obtained by adding properly prepared graphitizers to high carbon high silicon irons which are normally quite porous. He emphasized, however, that deoxidation must be handled carefully and balanced agents must be used to prevent ill effects such as formation of excess carbides and the like. With regard to steel castings, porosity and its causes was discussed at length, Chief causes, according to the speaker, are poor melting practice and poor furnace practice, but there are many phases to each of these. Addition of ferroalloys were covered, as well as action of deoxidizers and other phases of the gas elimination problem. Particular emphasis was placed on hydrogen absorption, its cause and cure.

Influence of manganese on hydrogen treated steel was shown in a series of slides. Effects of increasing temperatures on hydrogen content was also shown. Various types of inclusions causing porosity were shown on slides. Some discussion was given on the slag problem, and the value of a deoxidizing slag in minimizing inclusions was outlined. Actions of various additions to the steel in the ladle were also discussed. —*R. L. Hartford.*

Chattanooga

A ONE day foundry session was held in Chattanooga, Tenn., on Oct. 20, sponsored by the Birmingham District chapter of the A. F. A. Working in co-operation with the Birmingham chapter was a committee of Chattanooga members who were: H. W. Anderson, general chairman; J. T. Giles, chairman of plant visitation; Guy Bagley, chairman of entertainment committee; R. W. Hasselle, program chairman; Fred McGee, registration chairman; and Joe Warner, chairman of publicity committee. The program for the day was as follows:

9:30 a. m. Registration
10:00 a. m. Plant visitation.
12:30 p. m. Luncheon.
2:00 p. m. Round Table discussion, Paul Stuff, metallurgist and technician, Ross-Meehan Foundries, Chattanooga, Tenn., presiding.

W. E. Jones, Stockham Pipe Fittings Co., Birmingham, gave a talk on cupola practice and Charles Tidman, Columbus Iron Works Co., Columbus, Ga., discussed stove plate foundry practice. Paul Marceau, Moccasin Bushing Co., Chattanooga, Tenn., talked on nonferrous foundry practice. At 4:00 p. m. Charles B. Price of the Norton Co., Worcester, Mass., spoke on "Grinding in the Foundry." The talk was illustrated with technicolor motion pictures. Carl Carlson of the same company was present to answer and discuss all practical questions pertaining to gate cutting, cleaning and grinding of all types of castings. Wayne Nelson presided at the meeting. At 6:30 p. m. a banquet was held at the Read house with an address by Dr. Archie Palmer, president, University of Chattanooga, Chattanooga, Tenn., who was introduced by Lester N. Shannon, Stockham Pipe Fittings Co., Birmingham and vice president, of the A. F. A. Approximately 150 foundrymen from Tennessee, Georgia and Alabama attended the meeting.—*Farrar Hill, chairman, publicity committee.*

Buffalo

APPROXIMATELY 120 members and guests attended the regular monthly meeting of the Buffalo Chapter of the A. F. A. held at Hotel Touraine, on Friday, Nov. 3. W. J. Corbett, chairman of the chapter presided and Harry W. Dietert, president, Harry W. Dietert Co., Detroit, discussed, "Sand Control." Many interesting discussions between Mr. Dietert and the foundrymen took place.

Mayor Holling of Buffalo made a short speech during dinner and J. F. Linney, Republic Steel Corp., Buffalo, showed a talkie motion picture on bobsledding in the Adirondacks wherein his son Bob, introduced a new type of iron sled runner which enabled the American team to establish a new record. The treasurer, R. K. Glass, of the chapter gave a financial report and W. S. Miller, chairman of the membership committee presented a report as well. It was announced that the chapter will have a stag party in January which will be different from any held in the past.—*J. R. Wark, secretary.*

Northern Iowa

OCTOBER meeting of the Northern Iowa Foundrymen's association was held Tuesday, Oct. 31 at the St. Charles hotel, Charles City, Iowa. Approximately 150 members and guests attended together with 50 men from the Oliver Farm Equipment Co., who were special guests. Following dinner entertainment was arranged by the Oliver group and was enjoyed greatly by all. Hyman Bornstein, chief metallurgist, Deere & Co. was the speaker for the evening, discussing, "Recent Progress in Cast Iron."

Mr. Bornstein first reviewed the various elements found in ordinary cast iron and their effect on the action of the other elements as well as the structure of the metal. The common alloys were then discussed along with their effect on physical properties. The speaker also described the various melting units employed in producing gray iron and the advantages or disadvantages of each. By means of slides Mr. Bornstein then showed the properties of the various kinds of cast irons with the common alloys and the physical properties, microstructure and composition of the high strength gray irons. The processed gray irons such as meehanite were also discussed.

The process of producing malleable cast iron was reviewed and the structure, physical properties and uses of pearlitic malleable described. Other varieties of malleable such as: Pro-mal, z-metal, and arma-steel were mentioned. Engineering properties and applications of the various high strength cast irons and malleable irons were discussed and in the speaker's opinion, the use of these metals was definitely increasing.

The discussion was enjoyed and appreciated by the entire group as it was presented in a manner understandable to both technical and nontechnical men. — *R. E. Wilke, secretary.*

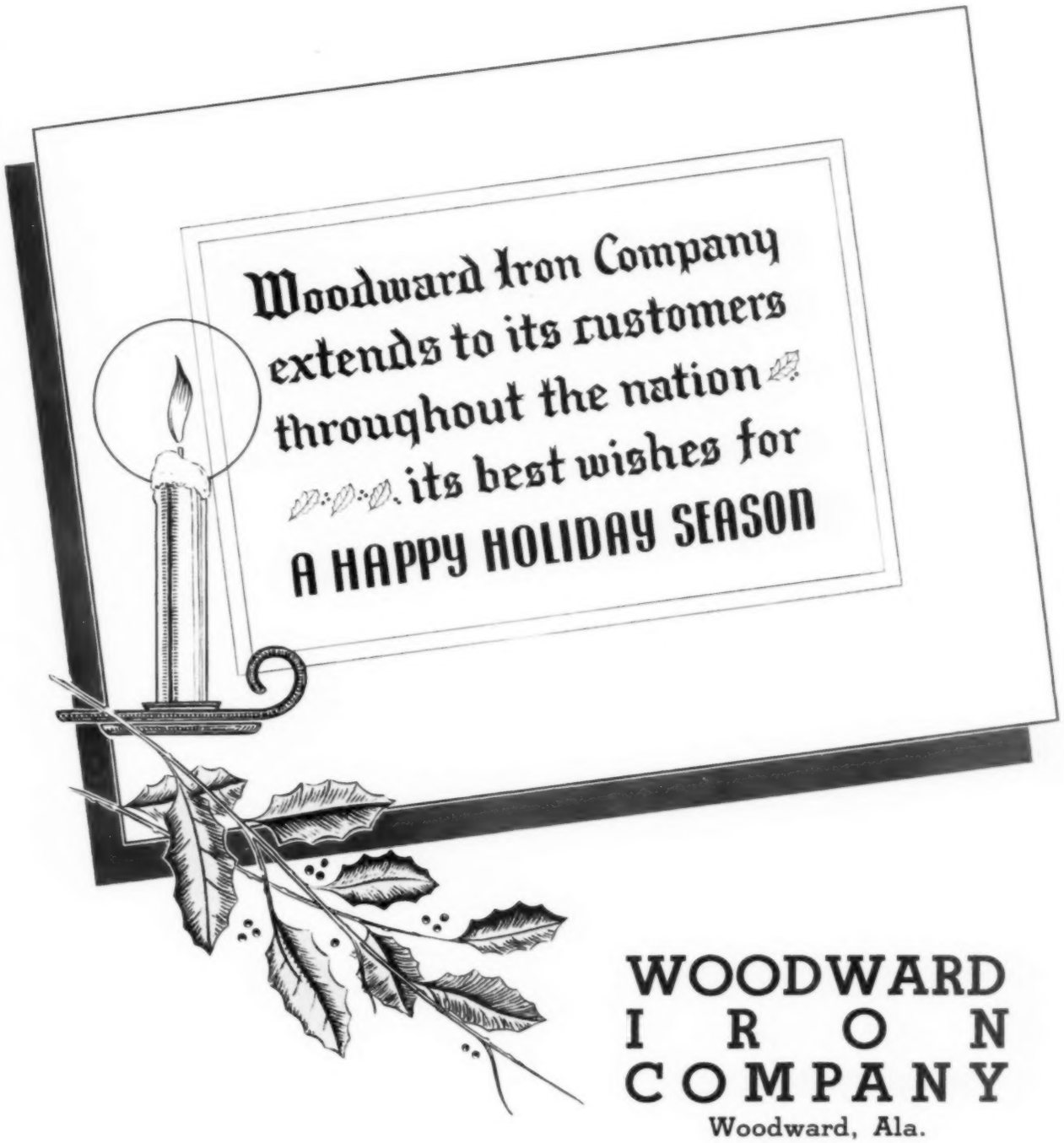
Northeastern Ohio

AT THE November meeting of the Northeastern Ohio chapter A.F.A. held at the Tudor Arms, Cleveland, Nov. 9 approximately 120 members and guests heard a witty and informative talk on selling castings by Art Hopcraft, purchasing agent Cleveland Worm & Gear Co., Cleveland, and a practical talk on foundry coke by B. P. Mulcahy, research engineer, Citizens Gas & Coke Utility, Indianapolis, Ind.

Drawing from his long years of experience as a purchasing agent, Mr. Hopcraft touched upon the science of selling from many angles, all pointing to the conclusion that the most essential features in modern selling—outside of course of a thorough knowledge of the product—are originality and the practice of psychology. Drawing in a similar manner on his memory, imagination and fertility of expression, he illustrated the many points of his talk by a series of anecdotes, modern stream lined and highly improved versions of incidents in the field cultivated in a scholarly and interesting manner many years ago by the late M. Rabelais and M. Maupassant.

Mr. Mulcahy's paper embraced a rather comprehensive scrutiny of factors in connection with melting iron in the cupola and was not limited to the fuel alone. As a preliminary feature he presented a description of the principal items in

(*Concluded on page* 83)



WOODWARD
IRON
COMPANY

Woodward, Ala.

Independent Since 1883

BROSIUS self-contained auto floor charging machine, built in capacities from 2,000 to 10,000 pounds

Mounted on three wheels, this machine can be turned 360° on its own wheel base, making it particularly suitable for work in congested areas. Requiring no tracks and no expensive runways, its movement is not restricted to any definite path; all that is necessary is a good floor on which to operate. The machine pictured here handles a standard 5' charging box, but Brosius auto chargers are also designed for handling slabs, billets, ingots, etc.; for serving heating furnaces, mills hammers, presses, etc.; for manipulating pieces under hammers and presses.

BROSIUS minimum head-room single hook grab buckets

make every crane a bucket crane. It is simplicity itself: you turn your ordinary crane into a bucket crane by throwing the hook block of the bucket over the hook of the crane, and going to work. Brosius single hook grab buckets trip by hand line, either from the operator's cage or from the ground, and they open without shock to the crane or to the bucket. In construction they are extremely simple: the latching mechanism consists of a single guide lever, a latch, and a trip lever.

BROSIUS automatic dump buckets

pay dividends in safety as well as in efficiency. In mills, industrial plants and foundries where the old type of contractor's buckets have been, and are being used, too many accidents have been traced to hand dumping. Brosius automatic dump buckets eliminate the necessity of having a man stationed at the dumping point, because the buckets are handled entirely by the crane-man and cannot be unlatched in mid-air.

Brosius Equipment Patented in U. S. and Foreign Countries

EDGAR E. BROSIUS, INC.

DESIGNERS & MANUFACTURERS — PITTSBURGH (SHARPSBURG BRANCH) PENNSYLVANIA

(*Concluded from page* 80)
the manufacture of coke and then took up the subject of the many factors affecting iron quality under four general heads: The cupola, raw metal, air, coke. Pointing to the almost limitless variations in detail the speaker instanced the following factors encountered in an attempt to standardize certain features: Height of cupola from charging door to bottom 8 to 30 feet, diameter 24 inches to 84 inches, charges 600 pounds to 12,000 pounds, melting rate 2 to 30 tons per hour, time of heat ¾ to 24 hours per day, tuyere area per cent 7 to 63, rows of tuyeres 1 to 3, coke ratios 4:1 to 12:1, steel in charge up to 85 per cent, scrap in mixture up to 100 per cent.

The greater part of the talk was devoted to the operation of and reactions in the cupola, with particular reference to the manner in which the final result is influenced by the size, shape and other features of the coke. He cited several typical instances in which the carbon content was changed to a marked extent by changing the size of the coke. Other characteristics of coke and their effect on cupola operation were covered under the headings: Volatile matter, ash, sulphur, combustibility.

He claimed that intimate acquaintance with all points of operation are necessary on account of the existing diversity. Danger lies in interpreting results from individual plants and stating these as fundamental facts. Too often these conditions exist only under the particular circumstance in one plant. If the same practices are employed elsewhere they might lead to serious difficulty.

Announcement was made that arrangements nearly have been completed for the annual Christmas stag party of the Northeastern Ohio chapter. It will be held on Dec. 14 at Hotel Carter, Cleveland.—*Pat Dwyer.*

St. Louis

WELDING and flame hardening were the subjects discussed at the Nov. 9 meeting of the St. Louis District Chapter of the A.F.A., held at the York hotel, St. Louis. L. E. Everett, Key Co., East St. Louis, Ill., and chairman of the chapter, presided and approximately 75 members and guests were present. Sergeant Roland J. Schumacher of the St. Louis Police department, gave the coffee talk which was entitled, "St. Louis Traffic."

Before the regular meeting, the board of directors held a special session and voted to co-operate with the Quad-City Chapter of the A.F.A. in presenting a joint conference in 1940. L. J. Desparois was appointed chairman of a committee to collaborate with the group. Other members of the committee are L. E. Everett and J. W. Kelin. S. M. Tiffin, new general manager of the St. Louis branch of Federated Metals division, American Smelting & Refining Co. was presented to the chapter members. T. R. Armstrong, International Nickel Co., presented an interesting discussion on welding and flame hardening and illustrated many of the points raised with a series of slides.

Announcement of the annual Hi-Jinx party was made. The annual affair is to be held Dec. 14 at the York hotel.—*J. W. Kelin, secretary-treasurer.*

FOUNDRYMEN STAGE ONE DAY MEETING AT MOLINE

APPROXIMATELY 225 members and guests registered for the one day meeting and plant visitation program arranged at Moline, Ill., Oct. 20 by the Quad-City Chapter A.F.A., with the co-operation of Northern Iowa Foundrymen's association, Northern Illinois-Southern Wisconsin Chapter of A.F.A., and the college of engineering, State University of Iowa. P. T. Bancroft served as chairman of the meeting committee with C. F. Scherer, Davenport Machine & Foundry Co., Davenport, Ia., as co-chairman.

The greater part of the day was devoted to plant visitation. Addresses by various speakers were presented at the noon luncheon and at the dinner meeting in the LeClair hotel. In the forenoon the members visited the plants of the Union Malleable Iron Co., and the John Deere Spreader Works, East Moline. In the afternoon the party visited the extensive plant of the Farmall Works, International Harvester Co., Rock Island, Ill. Other plants open for inspection included J. I. Case Co., Rock Island, Ill.; Mississippi Foundry Corp., Rock Island, Ill.; Rock Island Metal Foundry, Rock Island; French & Hecht Inc., Davenport, Ia.; Blackhawk Foundry & Machine Co., Davenport; Zimmerman Steel Co., Bettendorf, Ia. Earnest advocates of the belief that all work and no play makes Jack a dull boy, gamboled—if the spelling is correct—on the links of the Short Hills country club in the afternoon.

At the noon luncheon Col. N. F. Ramsey, commanding officer Rock Island arsenal presented an address on industrial mobilization. Col. Ramsey stated that through experience gained in the world war the various governmental agencies have perfected plans and taken the necessary steps to prepare for any eventuality. The country is divided into districts and all industries are listed in a manner to show how they may be enlisted and co-ordinated with others should the need arise. Long before the rolling drums announce that actual mobilization of the man power of the nation has commenced, the authorities must know what may be wanted in the way of equipment and supplies; where and in what quantity this material can be supplied. In many instances private industries have been given educational orders in recent years. This has been done for two principal reasons. The first is to familiarize private industry with government rules and regulations, tolerances, methods of inspection and standards of acceptance. The second is to give the government a definite idea of what quota can be assigned to any given plant should the need arise. While deploring present conditions in Europe, the speaker directed attention to the potential menace to the peace of these United States and assured his hearers that all that human ingenuity could do has been done to throw in the clutch when and if necessary to set the wheels of industry spinning at top speed.

At the dinner meeting W. H. Doerfner, general manager Saginaw Malleable Iron division, General Motors Corp., presented a remarkably interesting series of slides with running comment on reasons for installation of methods and equipment designed to increase production and lower operating costs. In his introductory remarks he pointed out that many years ago he arrived at the conclusion that the mental attitude of the men operating a foundry is more important than the building and equipment. The management must have a definite work pattern, or a definite objective to attain over a period of years. In his own case he had adopted the slogan: "If it has been done the same way for three years, it must be wrong!"

He claimed that whatever measure of success has been attained at his plant has been based upon the fact that the management constantly is analyzing conditions to deter-

mine whether or not conditions are static in any one of the hundreds of phases of the foundry business. More convincing than the spoken or written word, the slides showed before and after conditions in all departments of the plant, core making, sand handling, melting, pouring, molding, annealing, cleaning and shipping. The photographs in this series are reproduced on pages 22 to 27 of this issue.

A development now in progress probably will lead eventually to a process for making a complete set of malleable iron automobile castings in one mold. Possibly this mold may be as large as an office desk. Making a mold will be the same as printing a newspaper, every time the press comes down a complete set of parts will be made. The entire foundry from the core room to the finishing department will be in perfect balance. The proposal contemplates but one molding machine in the foundry. The molds will be made automatically. The large flasks will place themselves on the molding machine where they will be rammed and finished. The machine will index, placing the flask on a moving conveyor, then with another movement forward the cope previously turned over automatically will be placed upon the drag. The conveyor indexes forward to the pouring station where the metal will be poured directly from an electric furnace.

With the mold properly positioned the furnace will tilt forward and continue pouring until the little pop riser actuates a photo electric cell. This will return the furnace to normal position. The conveyor will again index to the shakeout station, where the cope and drag will be separated, castings and sand removed, and the flasks returned to the molding machine.

Men working in this foundry will be expert technicians wearing white clothes, white shirts and white shoes.

All this may seem to be visionary and outside the scope of practical accomplishment, but it has not been so many years since the usual custom was to make a single casting or possibly two castings in a mold. In the speaker's opinion what the foundry needs more than anything else is for men to wake up and do something, rather than to waste time just talking about the decadence of the industry.

The program was arranged and carried out by the following committee: Chairman, P. T. Bancroft, Moline, Ill.; co-chairman F. C. Sherer, Davenport Machine & Foundry Co., Davenport, Ia.; John T. Clausen, Greenlee Bros., Rockford, Ill.; Fred C. Nuss, John Deere Tractor Co., Waterloo, Ia.; A. V. O'Brien, University of Iowa, Iowa City, Ia.; M. J. Gregory, Caterpillar Tractor Co., Peoria, Ia.; Fred Kirby, John Deere Spreader Works, East Moline; John Diedrich, Blackhawk Foundry & Machine Co., Davenport, Ia.; A. E. Hageboeck, Frank Foundries Corp., Moline; Herman Alex, Rock Island arsenal, Rock Island; H. Bornstein, Deere & Co., Moline; J. H. Ploehn, French & Hecht Inc., Davenport; A. H. Putnam, A. H. Putnam Co., Rock Island; J. Morgan Johnson, Moline.

Arranges Institute On Foundry Control

An institute in foundry practices will be held Dec. 7, 8 and 9 at the University of Minnesota, Minneapolis, under the auspices of the Center for Continuation Study and the Institute of Technology. Theme of the institute will be "Modern Foundry Methods Necessary To Meet Casting Specifications". Daily program will consist of lectures and round-table discussions on such topics as refractories, raw materials, melting practice, metallurgical factors in casting design and production of alloy castings. All sessions will be held at the Center for Continuation Study on the university campus.

The tentative program includes the following subjects and speakers: "Pig Iron as a Foundry Raw Material", by Prof. T. L. Joseph; "Structure and Properties of Cast Iron", by Prof. Dowdell; "Sand as a Foundry Raw Material", by Prof. Thiel; three lectures on "Modern Cupola Practice", by Don J. Reese; "Heat Treatment of Cast Iron", by Prof. Richard Schneidewind, and "Design", by Elmer J. Carmody.

Form Association

Propeller Fan Manufacturers' association recently was formed under the sponsorship of the National Association of Fan Manufacturers, whose activities cover the broad field of heating and ventilating, drying and cooling, pneumatic conveying and dust exhaust, and mechanical draft in power plants. The new association will cover the use of propeller fans in the field of ventilation. M. W. Bauer, Aerovent Fan Co., is president; A. R. Stephan, DeBothezat Ventilating Equipment Co., vice president, and V. A. Shetler, secretary-treasurer. Headquarters are at 2-255 General Motors building, Detroit.

W. J. Bach, Foundry Service Co., 2321 Twenty-ninth avenue North, Birmingham, Ala., has been appointed Southern representative of the Carl-Mayer Corp., Cleveland, producer of various types of ovens.

Adventures of Bill

(Concluded from page 52)

I may remain all summer. The inhabitants do not reckon time as we do at home. What they can't do today they figure they can do tomorrow and if they can't do it tomorrow, why, the next day will do just as well. I was rather surprised to find how easily and readily I adapted myself to the prevailing custom. However, that need not stop you from writing me early and often.

"Well," I said. "Did they?"

"Did who, what?" Bill asked. "Oh, did they write? Here's a wire from the boys: Father, dear father, come home to us now. The clock in the steeple strikes one (Daylight saving time). You are filled with baloney and gadzooks with tripe from the saddlebags of that old reprobate Bill. So, hitch up the pony, throw away the peace pipe and hop a rattler for our own Bunker Hill. Come back to the bean pot, brown bread and the chowdah. Your affectionate sons Phoney and Loudah!

Data on Scrap

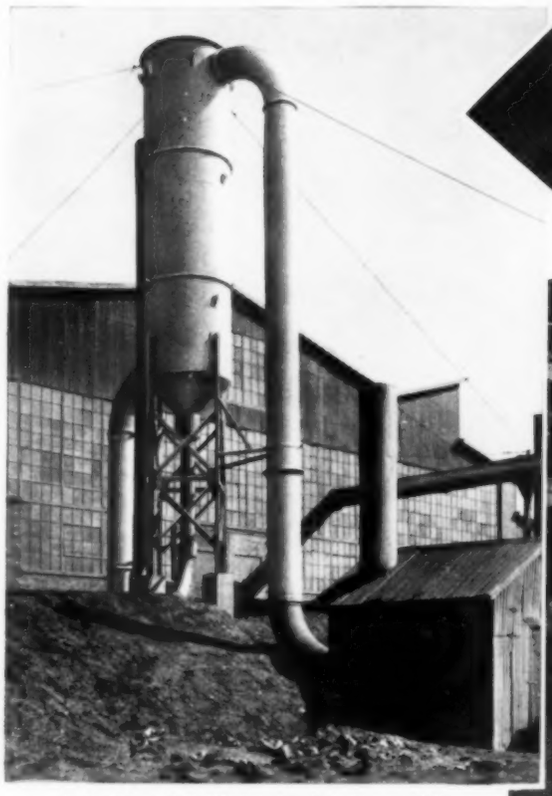
In recent years iron and steel scrap has received increasing recognition as an industrial raw material and has advanced rapidly as an article of commerce, the collection and distribution industry today being accorded its rightful place as an essential part of the industrial economy of the world.

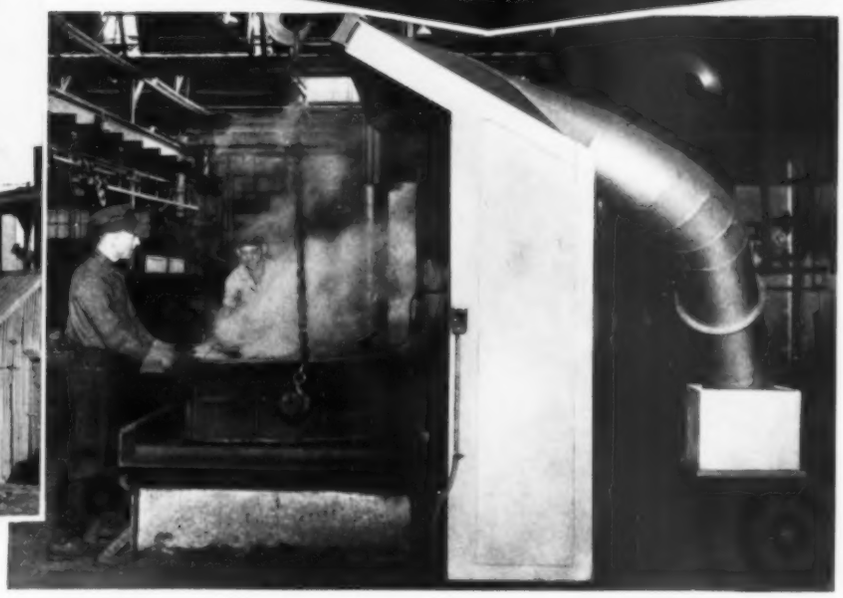
Reflecting the industry's growing importance, a literature devoted solely to scrap iron and steel is accumulating. The most recent addition to works hitherto available, is the yearbook of the scrap industry just published by the Institute of Scrap Iron & Steel Inc., 11 West Forty-second street, New York. This is the first compilation of iron and steel scrap statistics ever attempted on such an ambitious scale, incorporating data which have been slowly accumulating in recent years.

Subjects covered include the following: Scrap prices and steel ingot output; domestic consumption of scrap; vital statistics of the scrap industry; consumption of scrap compared with iron ore, pig iron and steel ingots; reservoir of future scrap; consumption of scrap and pig iron by states and districts; use of scrap in steel for leading industries; export trade in scrap; exports of scrap by customs districts; world trade in scrap; world exports of scrap; world imports of scrap; railroad traffic in scrap; scrap loadings by leading railroads.

The data were compiled and edited by the Institute's executive secretary, Edwin C. Barringer, and may be obtained from the institute for $1.

The Team that Beats DUST and FUMES!





Schneible Multi-Wash elevated to provide gravity pressure to a distant sludge disposal dump, eliminating handling. Right, the other member of the "unbeatable team", the Schneible "Uni-Flo" Hood, on a shake-out in a large grey iron jobbing foundry.

In fact, the unbeatable team for efficiency and economy of operation is Schneible Multi-Wash Dust Collectors and "Uni-Flo" Hoods. Hundreds of foundries use one or both of these equipments to secure positive, low cost dust and fume control.

Multi-Wash Dust Collectors use no wearing parts — nothing to break or burn — nothing to clog or freeze, no dead zones and no storage or rehandling of dry dust. Only water, at no head pressure, is used over and over again as the cleaning medium. These are the reasons why Multi-Wash Dust Collectors are guaranteed for 5 years against repairs or replacements.

Let us give you complete details — portable test units are available for trial installations—complete installation and operation details are contained in Bulletin No. 110 — do you have a copy?

Only Schneible Multi-Wash Dust Collectors are offered with a 5 Year Guarantee against repairs or replacement.

CLAUDE B. SCHNEIBLE CO.
3953 Lawrence Avenue, Chicago
Offices in Principal Cities

SCHNEIBLE

ABSTRACTS .....

FROM WORLD FOUNDRY LITERATURE

Cast Iron Scaling

Scaling of Cast Iron and the Adherence of the Scale Layer Formed (Ueber die Verzunderung von Gusseisen und die Haftbarkeit der gebildeten Zunderschichten), by E. Piwowarsky and W. Patterson, *Die Giesserei*, Duesseldorf, Germany, July 28, 1939.

The introduction of this article discusses the scale formation in pure metals and polyphase systems, and then the authors present data on some researches on scaling with different materials. Those are followed by a consideration of temperature relationship to scale formation, and the adherence of scale. They conclude that unalloyed cast iron scales more slowly than unalloyed steel in the region of 650 to 900 degrees Cent. Above 850 degrees the two approach the same speed in scale formation. Adherability of the oxide scale layer on cast iron is much superior to that on steel, especially in the range of 750 to 900 degrees Cent. Phosphor-rich cast iron (0.4 to 0.8 per cent) as well has a great inertness to scale formation and also a great adherability of scale or annealing skin.

Solidification Control

Control of the Solidification of Castings by Calculations, by N. Chvorinov, *Foundry Trade Journal*, London, England, Aug. 10, 1939.

Beginning with a discussion of variables influencing crystalization, the author turns to progressive solidification, and then describes how castings solidify. He points out that the problem of solidification of sand castings is mathematically the same as in the case of ingots, and then proceeds to develop various mathematical formulas for application to intricate castings, to cores, and to practice.

Controlled directional solidification can be obtained, according to the author, if the thermal properties of the mold are changed suitably, and from the various formulas developed, the thermal properties of the mold can be calculated. In some cases metal chills must be used, but in other cases, the action is too vigorous, and some other material must be substituted. Experience of the author indicates that magnesite brick serves well since its cooling capacity is about twice that of an average molding sand, but less than iron chills. He also mentions semimetallic chills, and indirect chills.

Alloy Melting

Compounding of Alloys by Melting, by Prof. Albert Portevin, *The Metal Industry*, London, England, Aug. 11, 18, and 25, 1939.

This lengthy article discusses all the factors involved in production of alloys through mixing and melting the component parts. The author begins with the postulate, "Being given raw metallic materials currently available and particularly industrial metals, the problem is to produce economically a liquid homogeneous alloy, ready for casting, without changes acting adversely against the useful properties of the casting." He then discusses factors in the problem, methods of heating, type of furnace, melting atmosphere, principles of melting, melting conditions, chemical changes, etc. which are concerned in fulfilling his postulate.

Statue Founding

Casting the Statue for the Voortreker Monument, anonymous, *Engineer and Foundryman*, Johannesburg, South Africa, Sept, 1939.

A brief description of certain features which entered into the production of a statue which is 13½ feet high and weighs approximately 2½ tons. The statue was produced by the lost wax process, and the procedure for making the molds is described briefly. One of the interesting points brought out was that while actual pouring of the casting only occupied the brief time of 1 minute, it took about 28 days to make the plaster of Paris mold, and 45 days to make the wax mold, fix the sections in position, and to melt out the wax. Before the casting will be ready for shipment, about 3 weeks will be required for cleaning up and giving the finishing touches.

Steel Castings

Principles and Practice Involved in the Production of Steel Castings, by D. Clark, *The Australasian Engineer*, Sydney, Australia, Sept. 7, 1939.

Beginning with the production of steel in the electric arc furnace, the author describes various features, and then turns to a discussion of the converter process, limiting that to the tropenas converter. That is followed by a discussion of molding sands. Designs of steel castings, and molding and machining of steel castings next is taken up, and that is followed by a general description of heat treatment and liquid quenching.

Alloys of Magnesium

Magnesium and Its Alloys, by J. L. Houghton, *The Metal Industry*, London, England, Sept. 1, 1939.

This article essentially is a summary of the work that has been completed by the National Physical laboratory, Teddington, England, on magnesium and its alloys. Mention is made of the addition of 2 per cent calcium plus 2 per cent silver which gives an alloy with a tensile strength of 9700 pounds per square inch and an elongation of 76 per cent at 290 degrees Cent. which is appreciably better than an alloy containing 4 per cent aluminum. Better results were obtained with alloys containing cerium, and one containing 9.9 per cent cerium, 1.5 per cent cobalt, and 1.5 per cent manganese at 300 degrees Cent. showed an ultimate tensile strength of 16,700 pounds per square inch and an elongation of 152 per cent.

Metallography

Metallography, Old and New, by Bernard Colllitt, *Canadian Metals and Metallurgical Industries*, September, 1939.

The author points out the importance of metallography since according to Prof. Desch's definition, it is a study of the internal structure of metals and of its relation to their composition and to their physical and mechanical properties. He divides metallography into 5 branches which include study of fractures, macrostructure, microstructure, radiography, and diffraction. With each he presents some historical facts and the modern applications.

Magnesium Alloys

Nonferrous Foundry Practice — The Magnesium Alloys (Concluded), by J. Laing, R. T. Rolfe, *The Metal Industry*, Sept. 1, 1939.

Concluding section XXVIII on magnesium alloys, the authors discuss the influence of other constituents added to or present in magnesium alloys. These include manganese, cadmium, silver, tin, lead, copper, nickel, silicon, and iron. Constitution of aluminum-magnesium alloys is discussed and that is followed by a brief description of the heat treatment of such alloys.

In molding practice the authors point out that a highly permeable silica sand is used, and it is bonded with about 5 per cent of colloidal clay. It contains about the same amount of water. To prevent reaction of the molten metal with moisture, various addition agents or inhibitors such as sulphur, boric acid and ammonium bifluoride are added to the sand. Sulphur also is dusted on the mold face and onto the stream of metal poured from the ladle. Surface of the casting can be improved further by smoking the mold face with an acetylene flame.

Melting is conducted in low-carbon cast steel pots heated by oil or gas. A large amount of fluid flux is used and a suitable composition contains 60 per cent anhydrous magnesium chloride and 40 per cent sodium chloride. About 100 pounds of flux are used for 300 pounds of metal. A suitable casting temperature is 100 degrees Cent. above that which the alloy is completely molten or some 682 to 750 degrees Cent., varying with the alloy used. Development of a fine grain structure can be promoted by preheating the melt at 800 to 900 degrees Cent. The metal is allowed to cool down to the proper pouring temperature.

Sand Blasting

Sand Blast Equipment, by A. G. Thomson, *Engineer and Foundryman*, Johannesburg, South Africa, September, 1939.

While this article is limited to the equipment of one manufacturer, it provides a concise description of the various features of several types of abrasive cleaning equipment available. Information is general and not technical. Short descriptions are given of sandblast rooms, cabinet types, rotary tables, and tumbling barrel equipment. Included with each is information on the particular application.

INTERNATIONAL MOLDING MACHINES

ARE INDISPENSABLE TO MODERN FOUNDRY PRACTICE. THEY INSURE MAXIMUM OUTPUTS, HIGHEST QUALITY OF CASTINGS AND LOWEST LABOR AND MAINTENANCE COSTS.

14 - Standard types for Cores
65 - Standard types for Castings
Many special types for work of unusual nature

INTERNATIONAL MOLDING MACHINE CO.
2608-2624 West 16th Street ✧ Chicago, Illinois

OBITUARY

RALPH STEWART MacPHERRAN, former chief chemist, Allis-Chalmers Mfg. Co., Milwaukee, and one of the outstanding metallurgists in the field of gray cast iron, died in Duluth, Minn., on Nov. 13. Mr. MacPherran was 68 years old and just recently had retired after 44 years service with the firm. Mr. MacPherran was noted especially for his co-operation in committee activities of several technical organizations, and for the assistance he had given many young metallurgists in the gray iron field.

For many years he was a prominent and active contributor to the committee work of the American Foundrymen's association and the American Society for Testing Materials, and has been identified with the work of the iron and steel industry for nearly 50 years. He was born at Sterling, Ill. on Feb. 1, 1871 and received his technical education at the University of Wisconsin, Madison, Wis., and the University of Michigan, Ann Arbor, Mich. Mr. MacPherran was graduated from the latter institution in 1892 with a bachelor of science degree in chemistry.

After leaving the university he was associated with the Illinois Steel Co. at the Joliet and South Chicago, Ill. works for 3 years. In 1895 he became connected with the former E. P. Allis Co., Milwaukee. Mr. MacPherran left that firm in 1907 to spend one year with the J. I. Case Threshing Machine Co., Racine, Wis., and then returned to the newly formed Allis-Chalmers Mfg. Co., Milwaukee. He had been associated with that organization ever since in charge of its chemical and physical laboratories.

As a result of his continuous and valuable investigations of gray iron Mr. MacPherran contributed numerous papers on metallurgy of both gray iron and steel before meetings of various technical associations as well as to THE FOUNDRY, and other technical publications. In 1929 he was a member of the group of American foundrymen that visited Europe to attend the International Foundrymen's congress, and also visited plants abroad on several other occasions.

In 1931 Mr. MacPherran was awarded the J. H. Whiting gold medal by the American Foundrymen's association for his many valuable contributions to the foundry industry. He was a member of the American Foundrymen's association, American Society for Testing Materials, International Society for Testing Materials, American Chemical society and American Society for Metals.

* * *

John Nicol, foundry general superintendent, Sibley Machine & Foundry Corp., South Bend, Ind., died recently.

* * *

Francis H. Bell, 72, widely known Canadian foundryman and journalist, editor and publisher of *Canada's Foundry Journal*, died at his home in Toronto, Oct. 4. Mr. Bell was born in St. Catherine's, Ont., Jan. 4, 1867 and at an early age went to

Ralph S. MacPherran

Dunnville, where he served an apprenticeship in a foundry operated by his father. Later as a journeyman molder he worked in several foundries in various parts of Canada. For several years he served as editor of the *Canadian Foundryman*. Since 1927 he was editor and publisher of his own paper *Canada's Foundry Journal*.

* * *

George B. Hamblin, 63, vice president and former works manager and purchasing agent, Whitin Machine Works, Whitinsville, Mass., died in Worcester, Mass., Oct. 20.

* * *

Neil C. Cameron, 61, Cleveland, salesman for the Dixon Crucible Co., Jersey City, N. J., died of a heart attack in Wooster, O., recently.

* * *

Henry Allen, superintendent of maintenance, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., whose death on Oct. 8, was announced in the November issue of THE FOUNDRY, was widely known to representatives of the foundry equipment industry for his mechanical ability, energy, and aggressiveness. Mr. Allen was born in Ninestone, Cornwall, England, Dec. 1, 1871, and came to the United States in 1901. He located at Trimountain where he served the Calumet-Hecla Mining Co. continuously until joining the Campbell, Wyant & Cannon organization in 1923. His son, Charles Allen, is secretary of the C.W.C. division at South Haven, Mich.

* * *

Dudley Baird, vice president, Pacific Foundry Co., San Francisco, died Oct. 18 at his home in Berkeley, Calif. Mr. Baird was associated with the Pacific Foundry Co. for many years and was considered one of the pioneer foundrymen of the Pacific coast.

* * *

Joseph H. Shaw, 61, president, Phoenix Brass Fittings Corp., Irvington, N. J., died recently. Born in Newark, N. J., Mr. Shaw had been affiliated with the foundry industry for almost 45 years. At one time he was a member of the firm of Shaw Bros., Newark, and upon the acquisition of that company by the Phoenix Brass Fittings Corp. 18 years ago, became secretary of the latter company and 2 years later president, the position he held at the time of his death.

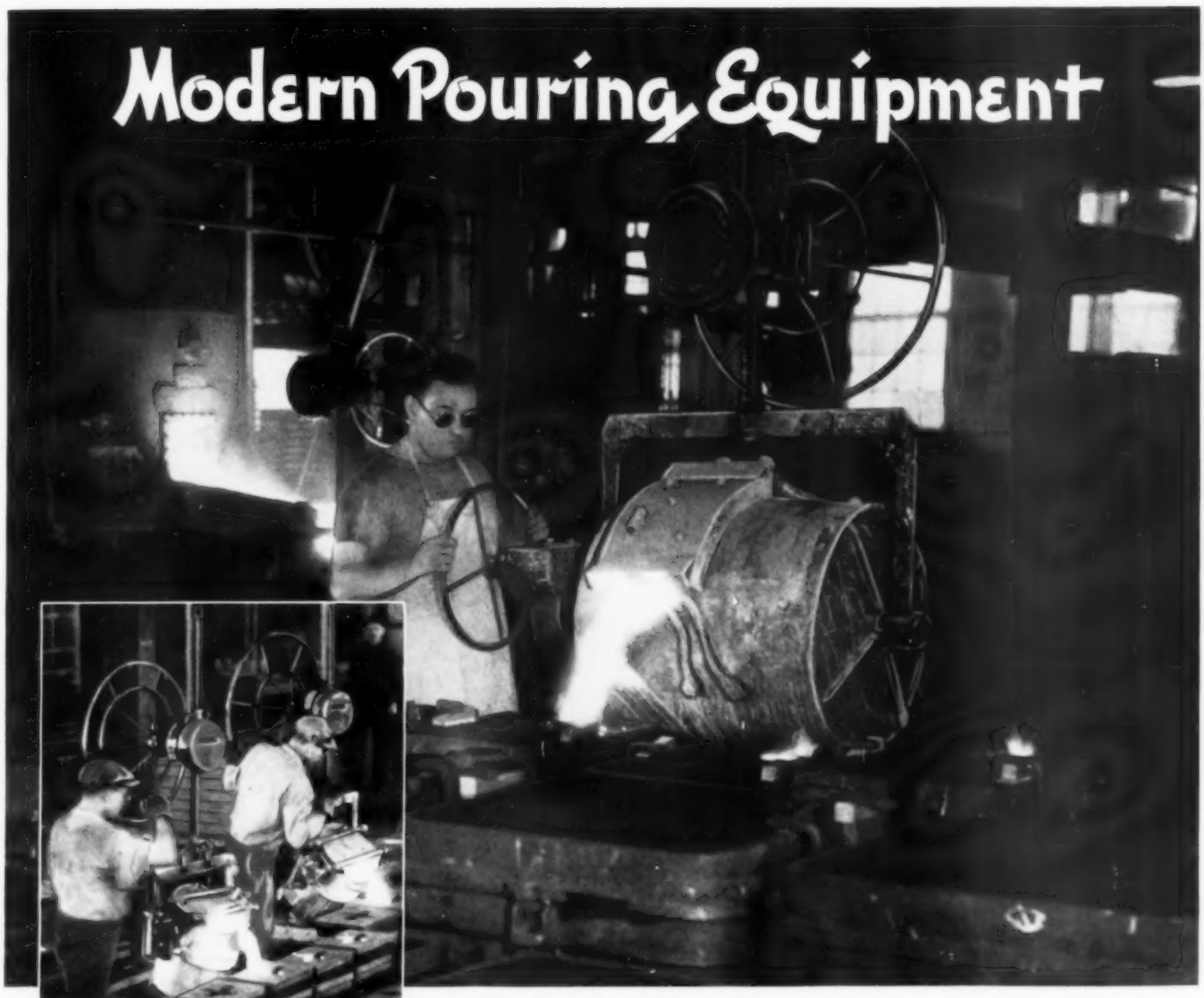
* * *

William Angell Viall, 78, vice president and secretary, Brown & Sharpe Mfg. Co., Providence, R. I., died Oct. 24. Mr. Viall was active in half a dozen large corporations as well as in philanthropic work. He joined Brown & Sharpe in 1890. In 1906 he was elected secretary and several years later, vice president and secretary. Mr. Viall also was president of Brown & Sharpe Co., and Brown & Sharpe of New York Inc., two subsidiary corporations.

* * *

Otto Agricola, 74, widely known as one of Alabama's greatest industrialists and the leading developer of Gadsden, died at his home in that city Oct. 18. Mr. Agricola was born November, 1865, in Marietta, Ga. As an apprentice tin smith at 18 he moved to Gadsden and shortly thereafter opened a stove and tin smith business. He sold the store in 1901 and with Dr. E. S. Jones organized the A. & J. Mfg. Co. Some years later he built the Agricola soil pipe plant, followed by the acquisition of the Coosa and Gadsden plants. After bringing these plants to the highest state of efficiency, he sold them to the Alabama Pipe Co., and decided to retire from active business. When the Southern railroad shops were moved from Gadsden, he took over the site and built the plant of the Agricola Furnace Co., principally as a philanthropic move to provide employment for men thrown out of work. He was instrumental in the establishment of a brick factory, dairies and other industries. He was president of the First National bank, Agricola Furnace Co., A. & J. Mfg. Co., the Gadsden Land & Building Corp.

Modern Pouring Equipment



Saves the Men and Cost

Hard, tedious work of pouring reduced to an efficient operation with a Modern Pouring Unit at **Otis Elevator Co., Yonkers, N. Y.** Practically all of the lighter work in this foundry is poured with Modern Pouring Devices on Modern easy operating cranes. All molds are poured on gravity conveyors; pourers are protected from the heat of the metal by Modern Ladle Covers. Metal is distributed to the pouring areas in Modern Covered and Insulated Ladles, insuring hot, clean metal. Molding production is no longer limited to pouring capacity; and better working conditions have resulted.

You need this equipment for profitable operation. Send for details today.

MODERN

Covered and Insulated Ladles

Lifetime Geared Ladles

Improved Bottom-Pour Ladles

Metal Pouring Systems

Crane and Monorail Systems for Metal and Mold Handling

Cupola and Furnace Charging Units

Sand Conditioning Systems

Patented & Patents Pending

MODERN EQUIPMENT COMPANY

PORT WASHINGTON, WIS., DEPT. 161

MODERN EQUIPMENT CO.

You'll Like the Fast Cutting Action of ALUNDUM ABRASIVE

A FAST cutting action—that's usually the first requirement of the abrasive used for polishing jobs in the foundry. And Alundum Abrasive fully meets this requirement.

Special crushing and screening processes control grain size and shape, giving sharp, strong grains that can cut fast. Special surface treatments give the grains extra capillarity—the ability to stay on the wheel head until all their work is done.

If you want to polish at the lowest possible cost per piece you'll want to give Alundum Abrasive a thorough trial.

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia Pittsburgh
Hartford Cleveland Hamilton, Ont. London Paris
Wesseling, Germany Corsico, Italy

G-98

NORTON ABRASIVES

FOUNDRY DEVELOPMENTS AT SHORT RANGE

POURING temperature is an extremely important factor influencing the production of nonferrous castings. Proper pouring temperature provides a casting which is more dense and free from leaks, and the physical properties are affected favorably. That is shown in some tests made on an alloy containing 88 per cent copper, 8 per cent tin and 4 per cent zinc. Poured at 1900 degrees Fahr. the tensile strength was 40,700 pounds per square inch and the elongation 20 per cent in 2 inches; at 1950 degrees Fahr. the tensile was 45,200 pounds per square inch, and elongation 25 per cent; at 2050 degrees Fahr. tensile was 48,000 pounds per square inch and elongation 42 per cent while at 2150 degrees Fahr. the tensile strength was 44,500 pounds per square inch and the elongation 28 per cent in 2 inches.

* * *

It has been estimated that from 15 to 25 per cent of all industrial accidents are due to poor lighting. These percentages have been disputed because it frequently is difficult to determine the true cause of an accident from the report, and thus many injuries which might be traced properly to poor lighting actually are assigned to other causes.

* * *

In some cases it may be found that difficulty in wearing safety goggles may be due to defective vision, and then goggles with prescription lens, or goggles designed to fit over the men's correction glasses should be provided. Lens of such goggles should, of course, be capable of withstanding eye hazards encountered by the wearer. Some firms supply goggles free of charge and pay for the eye examination. Others pay for eye examination and, supply the goggle frame, but require the worker to pay for the prescription lens. Still other firms pay half the combined cost of examination, prescription lens, and goggles.

* * *

RED paint is a constant reminder to workmen in a certain small shop of danger from falling objects, overhead cranes, belts, pulleys, etc. The floor areas in proximity to those hazardous zones are painted red, and the workmen become more alert and watchful while standing on or working in one of the sections. Since adopting the plan of plenty of red paint, it is claimed that no workmen have been injured.

* * *

According to some experiments conducted on a magnesium bearing aluminum alloy, remelting under a flux mixture composed of 2 parts sodium chloride and 1 part sodium fluoride, a serious loss of magnesium occurs. Consequently, if remelting more than twice, an addition of magnesium must be made. In the absence of the flux no loss of magnesium occurs. The particular alloy contained 1.3 per cent copper, 2.2 per cent silicon, 1.3 per cent nickel, 0.1 per cent magnesium, 1.0 per cent iron, 0.1 per cent columbium, and aluminum remainder. Alloys containing 1.5 per cent magnesium showed a higher loss of magnesium under the same conditions of remelting.

* * *

To prevent drying out in synthetic molding sands a recent patent suggests use of an oil in water emulsion, such as kerosine or fuel oil in water. It further is stated that high carbon materials such as asphalt, road oils, coal tars, etc. may be employed instead of the kerosine or fuel oil. Two methods are available to secure the oil in water emulsion. One is to use 3 parts by weight of triethanolamine, 8 parts of oleic acid, 89 parts of kerosine or fuel oil, and 100 parts of water. The other is to use 60 parts by weight of asphalt, 2 parts of a clay such as bentonite or beidellite and 40 parts of water. In both cases the mixtures are agitated vigorously until the emulsion forms.

* * *

A PROPERLY designed gate will meet two definite requirements. First, it will be large enough to permit metal to flow through rapidly enough to fill all parts of the mold cavity properly before solidification occurs. Second, it will not so large as to permit metal to flow with a rush into the mold. Too rapid a flow will cause excessive washing of the mold and the local generation of considerable steam which caught in the churning metal causes porosity in the casting.

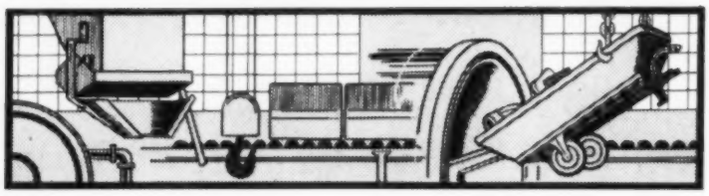
* * *

High lead, copper-base alloys are hot short and frequently cracks will occur in the cold castings at the intersection of light and heavy sections. That condition can be overcome by increasing the fillets at such junctions or by placing a riser on the heavy section and gating into the light section.

* * *

A British foundry employing the permanent mold process for production of aluminum alloy castings for automotive purposes makes the molds from a gray iron containing 3.2 to 3.4 per cent total carbon, 1.8 to 2.0 per cent silicon, 0.8 to 1.0 per cent manganese, approximately 0.06 per cent sulphur, 0.25 per cent phosphorus, and 0.20 per cent chromium.

NEW EQUIPMENT . . .



AND SUPPLIES

Wheel Bushing

Manhattan Rubber Mfg. division, Raybestos-Manhattan Inc., Passaic, N. J., recently has developed a vibration dampener bushing resilient mounting for portable grinders. This bushing now is incorporated in all grinding wheels manufactured by the company. Tests by the manufacturer have shown that the new mounting, which requires no change in existing equipment, increases grinding wheel life. Machine maintenance costs are said to be greatly reduced and a better grinding finish is obtained. It is also claimed that the mounting makes possible increased operator efficiency, minimum vibration and less fatigue.

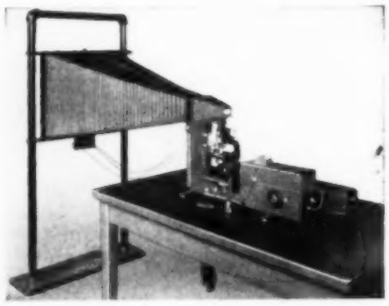
Gas Generator

Linde Air Products Co., 205 East 42nd street, New York, announces a new portable acetylene generator designed to combine portability with the operating advantages usually found in larger units. The new unit weighs 129 pounds and readily can be moved about in the shop or in the field. It holds 25 pounds of carbide and it is claimed will deliver up to 50 cubic feet of acetylene per hour at any desired pressure up to 15 pounds per square inch. Several hours of continuous welding or cutting on all except the heaviest work can be obtained from one charge.

It is claimed the generator produces a smooth flow of clean, dry acetylene with no appreciable variations in pressure, particularly valuable in maintaining a stable blowpipe flame. Operation of the generator is simple since only one handle is used to start or stop generation of the acetylene and to adjust delivery pressure. After starting, operation is fully automatic. Other advantages include two relief valves, one for the generation chamber and the other for the hydraulic back pressure valve; a large hydraulic back pressure valve which prevents carrying over of water to the hose and checks any reverse flow of gases; an interference mechanism which allows only the proper sequence of operation during recharging.

Dust Counter

Mine Safety Appliances Co., Braddock, Thomas and Meade streets, Pittsburgh, has introduced new equipment for counting and size



estimation of dust particles, as shown in the accompanying illustration. The new instrument projects an image of a microscope's field upon a ruled, vertical, translucent screen, providing a magnification of 1000 diameters for counting and 10,000 diameters for particle size determination. Advantages claimed for this equipment over microscope counting include: Samples are counted more rapidly and with less eye strain, concentrated samples are counted without dilution, dust particles are more easily distinguished from pits, bubbles, etc., particle size is more accurately estimated. The light from an automatic feed carbon lamp is reflected by the microscope mirror up through the field to a right angle projection prism fitted above the eye piece. A large leatheret bellows is provided between the prism and the ruled screen, 50 millimeters square. Remote controls enable the operator at the screen to focus the microscope and operate the mechanical stage.

Mold and Core Wash

Titanium Alloy Mfg. Co., Niagara Falls, N. Y., has developed a prepared core and mold wash which is supplied in the dry form, and only requires addition to water for use. The material, which is called T.A.M. zirconite A, is claimed to be highly refractory and has a melting point about 3775 degrees Fahr. It is milled to 325 mesh, and one quart weighs approximately 3¼ pounds. The material as supplied is ready for use except that it must be added to water, (not the water added to the flour), preferably hot water, and stirred in thoroughly to a consistency that permits the mixture to be sprayed, swabbed or painted on the core and mold.

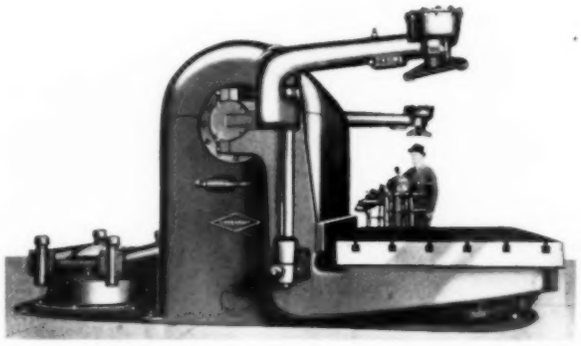
Lighting Unit

Hygrade Sylvania Corp., Salem, Mass., has developed a fluorescent lighting unit for industrial and commercial use. The unit is supplied complete with two standard 40 watt, 48-inch fluorescent lamps ready to hang up and plug into any standard 60 cycle alternating current socket. Two types of units are available, one for operation on 115 volts and the other on 230 volts. Among advantages claimed for this new development are that it is corrected for power factor, stroboscopic effect practically is eliminated and it is easy to install. The unit has an overall length of 57 inches, overall width 9 inches, and overall height 7 inches.

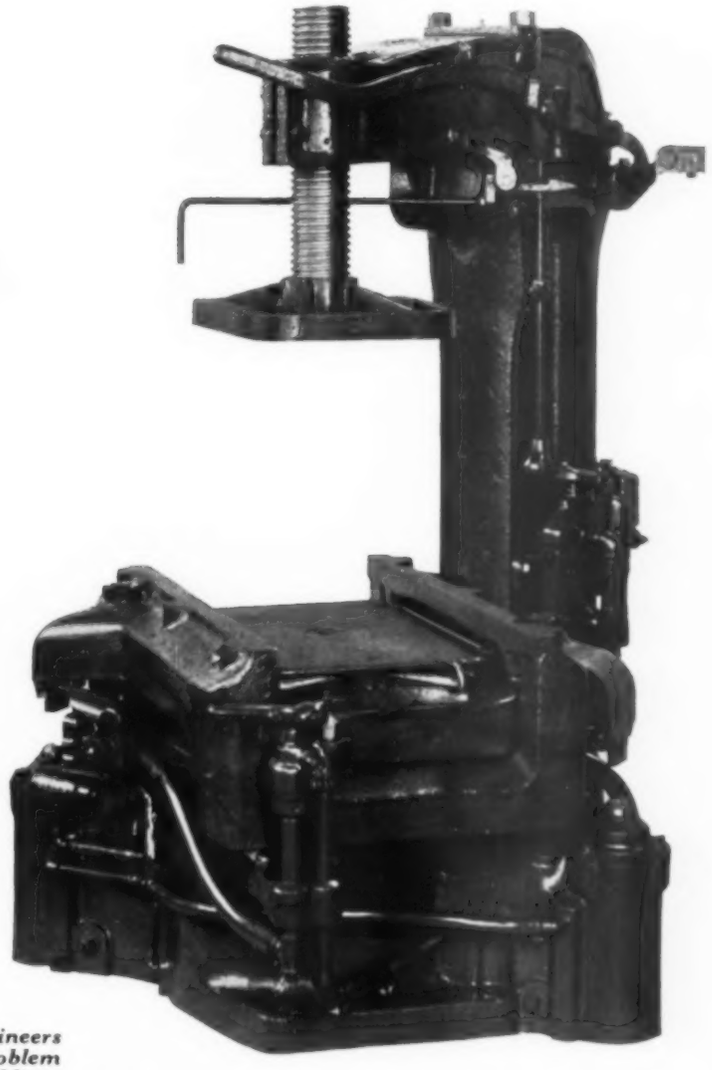
STICK-TO-IT-IVE-NESS

Milwaukee Molding Machines Prove Profitable Because They Invariably "Stick-to-the-Job!"

Perseverance in thoroughly analyzing the industry's needs is responsible for the continuously increasing acceptance of both Milwaukee and Davenport Molding Machines. Correct design and careful workmanship explain why only a minimum amount of motion and effort is required in the operation of these machines. They "stick-to-the-job", year-in, year-out, with practically no maintenance.



DAVENPORT Power Jolt Rollover Draw Machines for jobbing or miscellaneous work. More flexibility of application handling a wide range of flask sizes requiring minimum time for adjustment, yet fast in operation. All working parts completely enclosed in grease-packed housings.



MILWAUKEE Jolt Squeezing Strippers made in several sizes. The fastest and most rugged molding machines on the market. Turn out uniform, accurate molds on a fast, continuous production basis with minimum maintenance. Enables you to meet keen competition. Increases your profits.

Why not let Milwaukee Engineers study YOUR molding problem and offer a solution? No obligation. Write us today.

MILWAUKEE FOUNDRY EQUIPMENT CO.

3238 WEST PIERCE STREET • Cable Address "MILMOLDCO" • MILWAUKEE, WISCONSIN

CASTABILITY OF ALLOY STEEL CASTINGS

(*Continued from page* 29)

Conventional steel sand practice usually is satisfactory. We use a crude silica sand having an A.F.A. fineness of 41 to 45. Green sand facing mixtures have a permeability of 225 to 275. Typical screen analyses of molding sand are indicated in Table IV.

The high alloy or heat and corrosion resistant steel castings fall into three general groups: Chromium-iron alloys, ferritic or martensitic depending on the chromium carbon ratio; chromium-nickel-iron alloys, usually the stainless type materials in which chromium is in excess of the nickel content, may be austenitic or mixed structures of austenite, ferrite and carbides; nickel chromium iron alloys, usually the heat resisting materials in which nickel is present in excess of chromium, usually austenitic.

All of these may be modified in composition for purposes of castability or for special requirements with other elements, manganese, silicon, copper, molybdenum, vanadium, columbium, tungsten, selenium, nitrogen and others.

As with low alloy steels, much of the fluidity characteristics of the high alloys depend upon melting technique. These steels in all cases are electric furnace products, either arc or induction, and may be made with either acid or basic practice. We use acid arc type melting in which initial melting is carried on under oxidizing conditions. Silicon and manganese during the melting period are maintained as low as possible after which deoxidation, suitable alloy additions and finishing are conducted. Suitable slag conditions are maintained during refining by the use of dry lime, powdered ferrosilicon, calcium-manganese-silicon or other reducing agents. A single slag practice is used although two or more slags may be used as required. Dry charging materials and slag making materials are essential to prevent gas absorption. With large ferrochromium additions sometimes it is desirable to preheat this material before charging in the molten bath. Except in some of the chromium-iron alloys aluminum rarely is used for deoxidation.

Scrap Has High Alloy Content

Melting of the high alloys differs from the low alloy steels in that the charging scrap usually is of high alloy content. Carbon estimates cannot be made from conventional fracture tests.

The most difficult problems of fluidity are encountered with the very low carbon stainless steels, notably the 11.5 to 13.00 per cent chromium-iron containing a maximum of 0.12 per cent carbon and the 18 per cent chromium—8 per cent nickel alloy containing a maximum of 0.10 per cent carbon. The latter alloy frequently is specified with maximum carbon limitations of 0.07 per cent. Due to the very low carbon contents, these alloys, inherently sluggish, require high pouring temperatures. Melting operations require carefully maintained electrode and furnace control. Calcium-silicon and low carbon ferrotitanium are used with advantage for ladle deoxidation and for promoting fluidity.

In the 11.5 to 13.00 per cent chromium alloy, fluidity is enhanced considerably by maintaining manganese and silicon in a range of 0.90 to 1.00 per cent each which will not impair its stainless characteristics or respond to heat treatment. The 18-8 alloy may be produced with silicon up to 1.50 per cent and manganese up to 1.00 per cent without adversely affecting stainless or mechanical properties and with the advantage of producing a more castable alloy. Pouring temperatures of these alloys usually are in a range of 2800 to 3000 degrees Fahr., while tapping temperatures from the furnace up to 3200 degrees Fahr. are not unusual.

These alloys usually are characterized by a milky film which forms over the surface of the metal in the pouring ladle and which may form quickly on the pouring stream. Due to an increasing demand for lighter sections and minimum finish tolerances the ratio of casting weight to waste metal is the lowest of the cast ferrous alloys. Hazards due to misruns and minor defects tolerated in carbon steels but definitely

(*Concluded on page* 96)

Table II

Test Bar Report on Chrome-Molybdenum Steels

Heat No.	Yield Point Sq. In.	Tensile Strength Sq. In.	Per Cent Elongation in 2 Inches	Per Cent Reduction of Area	Fracture	C	Mn	Si	Cr	Mo.	Rockwell Hardness	Soaking Temp. F.	Soaking Time	Supplementary Treatments Temp. F.	Supplementary Treatments Time	Supplementary Treatments Cooling
1143H	95,000	133,450	4.5	7.5	Cryst.	0.39	1.02	0.62	0.79	0.38	C 28	1,650	1 hr.*			
30371B	68,750	103,750	23.0	43.4	Irregular	0.38	1.17	0.44	0.73	0.30	C 15	1,650	1 hr.*	1,250	1 hr.	air
1448F	166,700	184,700	11.0	39.2	Irregular	0.35	0.82	0.56	1.35	0.44	....	1,650	1½ hr.*	1,575	¾ hr.	oil
														1,000	2 hr.	air
28591B	94,000	116,600	20.0	53.1	½ cup	0.34	0.82	0.40	0.87	0.30	C 17	1,650	1 hr.*	1,550	1 hr.	oil
														1,250	1 hr.	air

* Cooled in air after soaking.

Table III

Test Bar Report on Chrome-Nickel Steel

Heat No.	Yield Point Sq. In.	Tensile Strength Sq. In.	% Elongation In 2 In.	% Reduction of Area	Fracture	C	Mn	Si	Ni	Cr.	Rockwell Hardness	Soaking Temp. F.	Soaking Time
2172F	75,300	121,100	18.5	41.3	½ cup	.33	.87	.53	1.39	1.32	C 16	1,650	1 hr.*
1910F	63,625	102,375	18.5	30.1	Irreg.	.33	.80	.40	1.57	.72	B 92	1,650	1 hr.*

* Cooled in air after soaking.

Around the Foundry with I-R Air Tools

A Saving in Each Operation

"MULTI-VANE" GRINDERS . . .

Powerful, smooth operation assures quick and efficient handling of grinding jobs. These handy tools are all equipped with speed governors, automatic lubricators, and two combination radial and thrust ball bearings. Sizes and speeds vary for handling grinding wheels from 1½" to 8" diameter.

CHIPPING HAMMERS . . .

Well known in foundries and steel mills everywhere, I-R chippers are built with the famous "flapper valve" which is self-seating and practically indestructible. Operators like their powerful action and easy holding qualities.

"SAFETY-FIRST" AIR HOISTS . . .

Ideal for foundry service. Protection from the effects of heat and dust is assured. Being free from vibration and because their control is so nicely graduated, they are especially fitted for delicate work such as drawing patterns or lowering a cope onto a drag.

SAND RAMMERS . . .

Tools that are built especially for foundry service. The self-seating flapper-type valve is practically indestructible, being able to pass sand and dirt without injury. Operators are assured of a powerful action combined with easy holding qualities.

Ingersoll-Rand Company

11 BROADWAY . . . . . NEW YORK, N. Y.

712-S

Ingersoll-Rand

(*Concluded from page* 94)

intolerable in these expensive alloys due to minimum of finish allowances and extreme accuracy requirements, cause scrap figures to run in higher percentages than with other ferrous cast products.

The higher carbon chromium-iron alloys with carbon up to 0.35 per cent and chromium up to 30 per cent and the 18-8 type alloys with carbon up to 0.20 per cent are somewhat more fluid than the very low carbon materials. Molybdenum from 2 to 4 per cent frequently is added to the stainless alloys, particularly the 18-8 combination for resistance to particular types of corrosion However no definite effects on fluidity have been noted from this addition. Selenium in amounts of 0.20 to 0.35 per cent indicate increased fluidity characteristics and is used for free machining applications.

Table IV

Screen Analyses

Screen	New sand (as rec'd.) %	Reconditioned sand %
On 6	0.6	0.2
On 12	0.4	1.0
On 20	0.6	1.4
On 30	5.0	7.6
On 40	33.4	37.0
On 50	28.0	27.8
On 70	19.0	16.4
On 100	8.4	6.4
On 140	3.2	1.4
On 200	1.0	0.2
On 270	0.4	0.0
Pan	0.4	0.4
Total	100.4	99.8
AFA Grain	44	41
Type Grain	Round	...

The 25 per cent chromium—12 per cent nickel and 29 per cent chromium—9 per cent nickel alloys usually are made in a carbon range of 0.20 to 0.30 per cent for corrosion resisting purposes. The high chromium 29-9 alloy is well adapted to foundry production of stainless steel castings, having satisfactory fluidity characteristics with the added advantage that heat treatment for the purpose of carbide solution in developing stainless properties is not mandatory as is ordinarily the case with the 18-8 alloys.

The heat-resisting alloys do not present as severe fluidity problems as do the stainless alloys. These materials usually are made in a higher carbon range of approximately 0.40 to 0.70 per cent with nickel from 30 to 70 per cent and chromium from 12 to 20 per cent. Two widely used types of heat resisting alloys are the 35 per cent nickel—15 per cent chromium grade and the 60 per cent nickel—12 per cent chromium grade.

While the same furnace precautions must be observed in the melting of these alloys, they do not appear to be as sensitive to moisture and dissolved gases as the 18-8 type alloy and can be poured at materially lower temperatures. Casting temperatures as low as 2600 degrees Fahr. can be employed successfully and must be controlled carefully for production of best possible surface, desirable grain size and solidity. A milky surface film is characteristic of the metal in the ladle and on the pouring stream. Ordinarily it does not interfere with the smooth running of the casting.

Fig. 1 shows the comparative fluidity of four types of materials, as measured by a simple fluidity tester. This tester is poured with a runner basin which maintains constant head of metal. The relative fluidity of the material is measured by the vertical height of metal obtained in a 5/16-inch square section. The 35-15 alloy indicates good fluidity, whereas at approximately the same pouring temperature, low carbon steel is quite sluggish. The chrome-vanadium alloy (S.A.E. 6150) and the stainless alloy (29-9) indicate fair fluidity at the temperatures indicated.

Melting ranges and usual pouring temperature of a number of heat and corrosioin resisting compositions are given in Table V.

Sensitive To Dissolved Gases

Stainless steel alloys are more sensitive to dissolved gases than are the higher carbon heat resisting materials. The 18-8 type alloy and the 11.5 to 13 per cent chromium alloy are extremely sensitive to moisture and care must be exercised to use well dried ladles and preferably skin-dried or dry sand molds.

Porosity in the 35-15 type alloy is rare, although the 60-12 alloy appears to be more susceptible to that type of defect. Green sand may be used successfully for the heat-resisting alloys.

Shrinkage allowances for patterns usually are ¼-inch per foot for the high alloys although this may vary up to 5/16-inch per foot. The stainless alloys are more difficult to feed than the heat resisting alloys and require probably somewhat more metal in the risers. Gating into risers to effect introduction of hot metal into the feeding heads is effective as well as the use of riser coverings to maintain temperature in the feeding metal.

Hot cracking in the high nickel-chromium austenitic alloys does not appear to be as troublesome a factor as in the low alloy steels, although correct design is fundamentally important and all reasonable precautions for freedom of contraction must be observed. This probably is due to the fact that these materials are austenitic on cooling down to room temperatures and hence do not set up internal strains due to expansion and contraction during phase changes as in other types of materials. They also assume considerable strength on cooling from 2000 degrees Fahr. and downward. Chromium irons appear somewhat more troublesome from the standpoint of hot cracks.

Obtain Smooth Surfaces

The same types of sand may be used for the high alloys as for the low alloy steels. To obtain smooth surfaces on the heat resisting castings it is permissible to use finer sands with permeability in a range of 75 to 90. Care must be exercised in the use of mold washes to insure absolute dryness to avoid blows or gas cavities.

Since strength at elevated temperatures is a prime funtion of the heat resisting castings which frequently perform as moving units in elaborate mechanisms, it is essential that the highest degree of soundness, accuracy of detail and section, and freedom from surface imperfections be attained to insure successful trouble free operation of these types of materials.

Chicago Pulley & Shafting Co., 17 North Desplaines street, Chicago, has been appointed distributor of the Ajax Flexible Coupling Co., Westfield, N. Y.

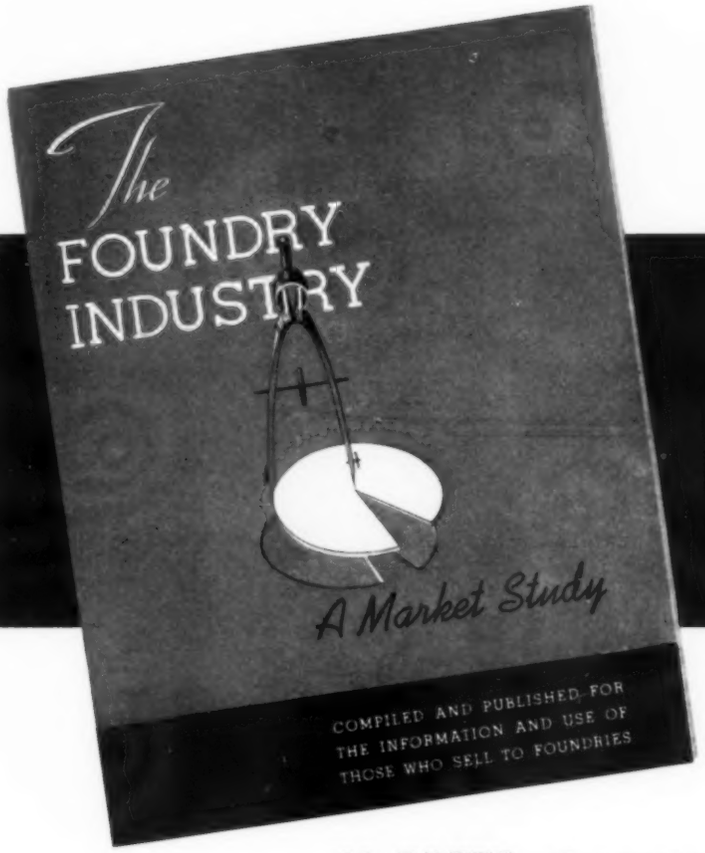
Table V

Heat and Corrosion Resisting Alloys

	Melting* Range— Deg. F.	Pouring† Range— Deg. F.	Fluidity Characteristics
12% Cr 0.12 C max.	2525-2723	2800-2900	Inherently sluggish
28% Cr 0.50 C max.	2462-2723	2700-2800	Fair
18% Cr 8% Ni 0.06 C max	2552-2678	2800-3000	Inherently sluggish
18% Cr 8% Ni 0.15 C	2552-2678	2800-2950	Fair
25% Cr 12% Ni 0.30 C max.	.....	2700-2900	Fair
29% Cr 9% Ni 0.30 C max.	2552-2732	2700-2900	Good
35% Ni 15% Cr 0.50 C	2552-2705	2600-2850	Usually very good
62% Ni 13% Cr 0.60 C	2300-2552	2600-2800	Very good

*Strauss—A.F.A. *Cast Metals Handbook*—1935.
†Optical Pyrometer—Corrected for emissivity.

A COPY OF THIS NEW BOOKLET AWAITS YOU



for
ADVERTISING AND SALES MANAGERS

16 **PAGES** of penetrating market data presented in an interesting, readable manner in definition of one of the outstanding industries in the metal working field: the foundry industry . . . a market whose annual production averages over one billion dollars . . . a market which buys a tremendous volume of equipment and materials . . . a market which deserves the interest and study of those who sell to the metal working industries.

WHEREVER METALS ARE CAST . . . YOU'LL FIND

THE FOUNDRY

A Penton Publication

1225 WEST THIRD STREET CLEVELAND, OHIO

ENGLISH FIRM CASTS BELLS FOR 369 YEARS

(*Continued from page* 35)

The firm shipped a 11½-ton bell to Notre Dame cathedral in Montreal and shipped the original Liberty bell to the United States in 1752. One of the most famous peals of bells was shipped to St. Michael's cathedral, Charleston, South Carolina. These bells were recast in 1865 from a former peal made in 1764. During the war of Independence the bells were seized and sent to England, but later were redeemed by an American merchant. During the war of secession the bells were removed to Columbia for safety but were wrecked when the city was burned. The metal was recovered and shipped to the Whitechapel foundry and recast into a peal of eight bells. The largest, or tenor, weighs approximately 1 ton.

Other important American installations include 10 bells for Kent School, Connecticut, a carillon for Hamilton, Ont., and another for Victoria, B. C. Bells made by the firm include practically every variety, church bells, carillons, clock bells, hand bells, sleigh bells, ship bells, fire bells, cow bells, cymbals, gongs, etc.

Principal activity centers around peals or sets of bells for churches, schools, etc. Bell metal contains 4 parts copper to 1 part tin. The tin is from vein mines and not from alluvial deposits. Specific gravity of the bell metal is 8.7. This standard composition has not varied for centuries. In a number of church bells originally cast in 1594 and recast in 1885, analysis of the metal was found to be the same and is practically identical with the metal used today. The only variation from this standard is for special bells, other than church bells. For example recently the Whitechapel works manager spent some time at Hadfield's in Sheffield, to superintend the finishing of a 22-inch diameter ship's bell, cast in stainless steel.

Tone Depends on Shape

Tone of a bell depends on the shape or dimensions and the composition of the metal. Sizes of bells to produce certain notes, say the eight notes of the diatonic scale, can be worked out by simple mathematical formula based on the vibration time of these notes. Shape of the bell and metal thickness are important factors. Allowing for certain personal preferences on minor features, bell makers generally agree on certain standard proportions of one part to another. Thus, taking the thickness of the sound bow or brim, that is the area where the clapper strikes, a bell should measure 15 brims in diameter at the mouth; 12 brims high at the shoulder; and 7½ brims wide at the shoulder.

Size of a bell is governed by many factors, the most important of which is the general character of the bell tower and its ability to withstand the weight and vibration. Usually the architect works in collaboration with the foundry manager and they arrive at a mutually satisfactory decision on the weight and the best method of mounting. For many years ears, loops or canons were cast on the crown of the bell and these in turn were fastened to the stock with iron hooks and straps. In the modern method as practiced at the Whitechapel foundry the bell is cast with a flat top and suspended by bolts passing through the head.

After the size and proportions of the bell are decided upon, the various gages and sweeps are made by the patternmaker working with the greatest degree of accuracy to the specifications laid down by the designer. The art of making these gages or sweeps has been handed down from father to son for many generations and is regarded as a highly coveted and closely guarded secret.

Mold Made in Metal Casing

Bell foundry practice differs to a considerable extent from that found in other lines of casting production. Instead of a large flask filled with sand, the mold is made in a metal casing closely conforming to the size and shape of the bell. The molding material is a soft loam or mud and is applied by hand to the casing for the outside or cope of the mold, and to the brick work forming the core, or inside part of the mold.

Outside casing and the core are swept up separately as shown in Figs. 4 and 3 respectively. Method of holding the square spindle and for adjusting the sweep board for the casing, in use for many years, indicate that the old time molder was fully as ingenious as his modern prototype. The cast iron casing is inverted until after the coating material has been applied, finished and dried. Then it is rolled over with the aid of suitable trunnions on the sides and lowered on to the core or inside part of the mold shown in Fig. 3. The area several inches wide at the bottom of the core is slightly tapered and by coinciding with a corresponding area near the lip of the casing, guides the latter accurately into place so

(*Concluded on page* 100)

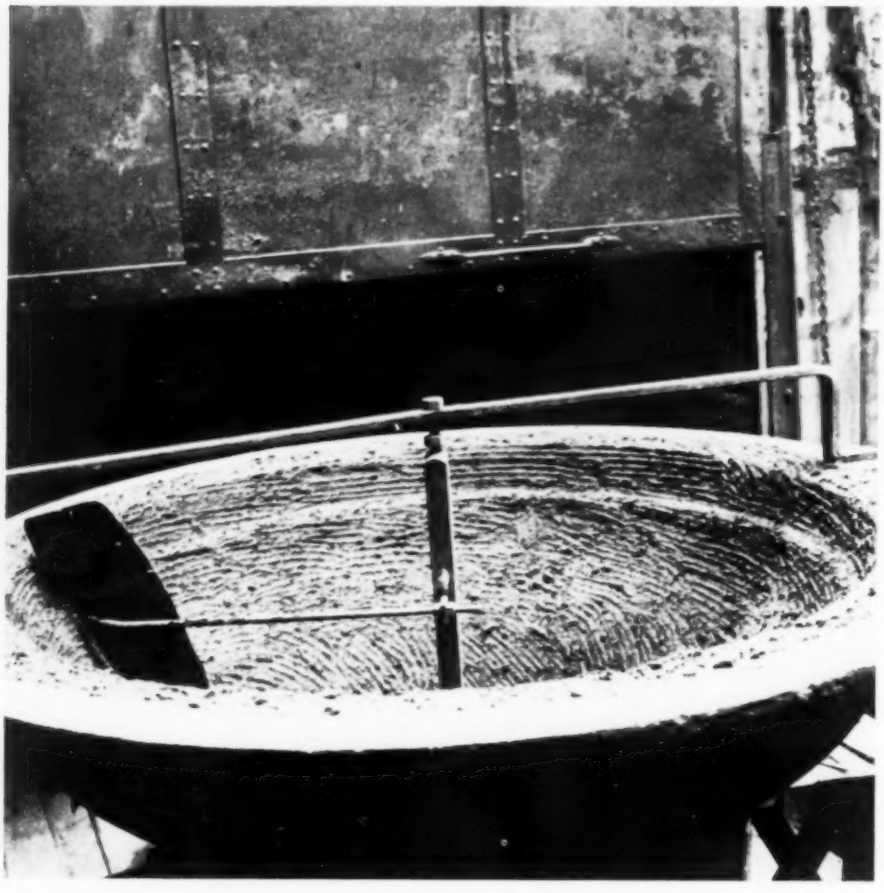


Fig. 4—Lining of inside of case in its early stages. Rough marks are made by the molder's fingers and provide a grip for the following coats of loam

ANNOUNCING Cleanblast "ALLOY 99"

THE ONLY MAJOR IMPROVEMENT IN BLASTING SHOT IN THIRTY-FIVE YEARS—An entirely new alloy shot for all metallic blast cleaning operations, now offered to the foundry, forging, heat treating and metal industries for the first time.

"Cleanblast Alloy 99" developed, tested and produced only by us, will clean more than twice the work of any standard metallic abrasive blast material. It is designed for plants turning out particular work requiring the best blasting materials, less loss through exhaust systems and the minimum addition of new shot during blasting operations.

"Cleanblast Alloy 99" costs less in the long run and is equally efficient in airless and pressure blasting operations.

Available in Shot—sizes No. 5 to No. 30

"Cleanblast" alloys are patented.

WRITE, WIRE OR PHONE FOR FULL INFORMATION

ALLOY METAL ABRASIVE COMPANY

311 W. HURON STREET — ANN ARBOR, MICH.

AN IMPORTANT NEW BOOK . . . All the essential facts you need to know about impact cleaning are described in

IMPACT CLEANING

OUTSTANDING FEATURES:

- Abrasive Recovery
- Steamblast Equipment
- Waterblast Equipment
- Removal of Cores
- Cleaning Nonferrous Materials
- Troubles and Remedies
- Convenient Formulas
- Air Lines
- Batter Type Wheels
- Slider Type Wheels
- Vaneless Type Wheels
- Rebuilding Existing Equipment
- Field for Impact Cleaning
- Dust Removal Problems

Entire book is cross-indexed for easy reference.

BY WM. A. ROSENBERGER

This 480-page book is a mine of information pertaining to all phases of impact cleaning formerly called sandblasting written for the benefit of all those who design, build, sell or use impact-cleaning equipment.

Written from the practical experience of a leading impact cleaning authority.

Both highly technical data and descriptions of practical cleaning operations make this book valuable for all those interested in impact-cleaning processes of any kind.

IMPACT CLEANING is crammed with practical up-to-date original data about equipment, abrasives, and operating details, and is indeed an important tool that you will find a daily necessity.

480 pages, 6 x 9 . . . 255 illustrations . . . 160 formulas . . . cloth bound
Price $7.00 Postpaid

Send for Your Copy Today!

USE THIS COUPON

THE PENTON PUBLISHING COMPANY,
Book Department, Penton Building, Cleveland, Ohio.

Enclosed is $7.00 for which please send, delivery charges prepaid, one copy of IMPACT CLEANING, by Wm. A. Rosenberger, just published.

**Orders for delivery in Ohio should include 21c additional for compulsory 3% sales tax.*

NAME .....

ADDRESS .....

CITY ..... STATE .....

(*Continued from page* 98)
that both parts of the mold are concentric and in proper relationship to each other. The cavity between the two then is filled with metal to form the bell.

Inside of the iron casing is covered with a thin coating of yellow London clay or loam mixed with horse manure and horse hair, 4 parts clay, 1 manure and ½ part hair. The mixture is shoveled on to a low brick or slate table and beaten by hand with a slender rod or beater. It is claimed that this primitive mixing method produces a *kinder* loam or *stuff* as the workmen call it, than a mechanical mixing device. The mixture and the method have not changed during the three and a half centuries the company has been in existence. This does not represent stubborn conservatism, but a realization that modern methods while quicker and more economical cannot produce a mixture as good or better than the material which has served so satisfactorily over such a long period.

A large stock of cast iron casings is available for making the different sizes of bells. The largest will be used for casting the 14½-ton tenor bell for the new Anglican cathedral at Liverpool. The casings are a fairly modern development and replace the clay and brick copes reinforced with iron bands, formerly employed.

The first loam coating is rather coarse in texture and is *roughed* with the fingers as shown in Fig. 4 to secure proper adherence of subsequent coats. After a light drying in the oven a second coat is applied. This coating contains smaller amounts of dung and hair. This layer also is dried. The face is thus built up of succesive layers until a revolution of the sweep indicates that the face of the mold conforms approximately to the desired shape. The face then is covered with a thin or *slip* coating of very fine loam and the sweep is revolved once to impart a smooth, uniform surface. Any necessary ornamentation or letters are pressed into the soft face. The surface is covered with a thin coating of plumbago mixed with water and a small amount of molasses or other binder. This coating is slicked with the tools and then finished perfectly smooth with a camels hair brush dipped in a thin solution of the original plumbago wash.

Use Proper Clay

Success with this type of molding is claimed to depend principally on the use of the proper grade of clay as a base and in the different layers. In the casing a larger amount of used clay can be used in the mixture, as compared with the mixture on the core. Object of using the horse hair and dung is to improve adhesion of the layers and to prevent cracking or crazing of the face during the drying process. The mixture also increases the permeability and thus removes the hazard of gas becoming impregnated in the metal.

The core built on a heavy, circular cast iron plate is a brick wall conforming approximately to the desired shape of the inside of the bell. Clearance of ¾-inch is left between the sweep and the face of the brick. This space is covered with a layer of fairly thick loam and roughly swept to shape. Additional coats of finer material then are applied and swept to a smooth finish.

After the case and core are dried thoroughly in the oven, the core is removed first and lowered into a brick lined pit in the floor. The casing then is picked up by the crane, turned over and lowered into place over the core. The two parts of the mold are bolted together after which sand is rammed in the pit all around the mold to a point approximately three fourths from the bottom. Metal is poured into the mold through one or more pop

(*Concluded on page* 102)

BRINELL TESTING *made easy!*

...WITH THIS NEW MACHINE

■ With the ever increasing demand for rigid inspection of castings, it is necessary that your testing equipment be so designed that the tests can be made with a minimum amount of time and handling.

The new Model PHL Detroit Brinell Machine has been designed specifically to meet these requirements. The wide, easily accessible table permits the quick inspection of awkward shaped castings and the ram travel of 18" makes screw adjustment unnecessary. Tests are obtained by the movement of a single lever.

This new Detroit Brinell Machine can be used on individual pieces or installed in your conveyor line. It is fast and accurate and is obtainable in the model illustrated or with the direct, automatic reading feature.

Write for Bulletin

DETROIT TESTING MACHINE CO.
5139 Trumbull Ave. Detroit, Michigan

Pick up MORE PROFIT!

FROM YOUR BLAST CLEANING OPERATIONS

- "CERTIFIED" Steel Abrasives go a long way toward keeping blast cleaning costs, both air and airless, to a minimum. They are the toughest, hardest steel abrasive on the market today. Research has lately found a way which gives extra crushing strength to the previous advantages of this fifty year superiority of "CERTIFIED".
- So why not do as most other shops do. Pick up more profit by using "CERTIFIED" Steel Shot and Grit. Order a shipment today.

PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.
STEEL SHOT AND GRIT CO.
BOSTON, MASS.

FOX HI-SPEED SWING FRAME AND STAND GRINDERS

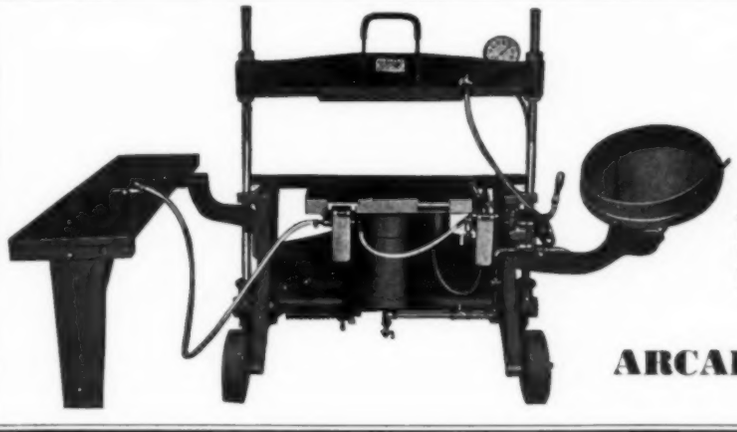
16"—20"—24"

MULTIPLE V-BELT
2-Speed, Fool Proof Safety Drive
Guaranteed for 2 years against any repairs

HEAVY DUTY STAND GRINDER
Made in 2 sizes—24" and 30"

Send for full description and prices

FOX GRINDERS, INC., Oliver Building, PITTSBURGH, PA., U. S. A.



DEPENDABLE JOLT SQUEEZERS

	No. 81	No. 91	No. 101
Jolt Cyl.	3"	4"	5"
Squeeze Cyl.	8½"	10"	13"
Between Uprights	32"	36"	38"

ARCADE MANUFACTURING CO.
Freeport, Illinois

(*Concluded from page* 100)

gates on the top, depending on the size of the bell.

Metal is melted in an ordinary reverberatory type furnace with capacity from 6 to 10 tons fired with soft coal instead of the beech wood employed for centuries and considered indispensable. Metal is tapped into a ladle and poured into a runner basin as shown in Fig. 1. In this instance the bell is comparatively small and the mold is practically all above the floor level. Castings, according to size, are left in the molds to cool for periods of 1 to 4 days. Where a peal of bells is ordered, great care is taken to see that the composition of the metal and the temperature at which it is poured are held constant. Otherwise there will be a noticeable difference in the tonal values. The largest, or tenor bell is cast first.

In the tuning room the bell is tested with a tuning fork. If it is too sharp it is placed on a boring mill and a certain amount of metal is removed from the inside. Obviously this is a job for an expert. If the tone is too flat the bell is scrapped and recast. The modern tuning machine, shown in Fig. 2, is considered one of the most important if not actually the most important contributions to successful bell making. Incidentally it is claimed that the Whitechapel firm was the first to use a mechanical device for this purpose. The first one was driven by a horse. A large wheel geared to the main drive revolved the cutting tool around the inside of the stationary bell. On the modern machine the bell is attached to a revolving table electrically driven at any desired speed. The tool is moved up or down to cut metal from any part of the bell. This machine was installed in 1921. Final finish to the surface of the bell is imparted by sandblasting and polishing.

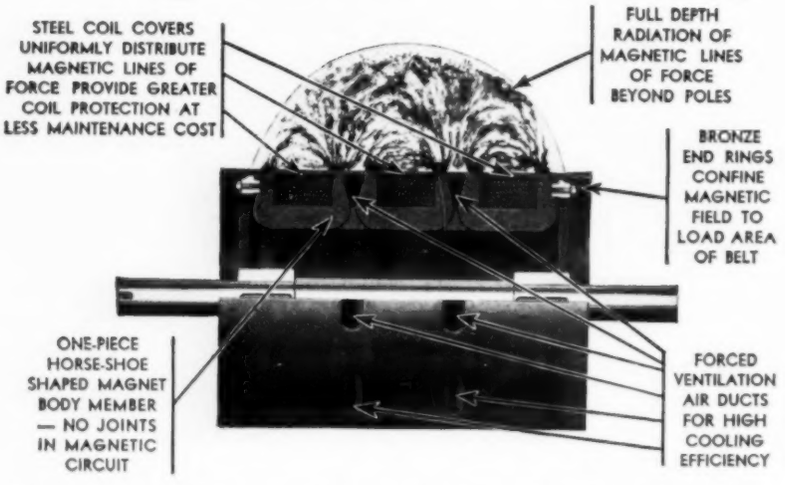
Technique Was Different

Before the cast iron casings were adopted many years ago, a different technique was employed in forming the mold. The core was swept up first to the correct size and contour. One or more thicknesses of hay rope were wound around the core to correspond to the approximate thickness of metal required in the casting. A coating of loam was swept over the hay rope to form a replica of the outside of the bell. This coating was dried with braziers and then the outside part of the mold was built up with bricks and loam, as in modern loam molding practice, or simply with a heavy thickness of loam reinforced with iron bands. When this was dried it was removed, finished and then dried thoroughly. The thickness of hay rope and loam was removed from the core and after inside and outside of the mold were finished and dried they were assembled in a pit and sand was rammed around the outside as at present. The smaller bells were poured from ladles, but the larger bells received the metal directly from a long spout in front of the furnace.

A booklet, No. 115 in the production series of the American Management association, recently has been published, and is entitled, "Improved Methods in Packing and Shipping." The chapters include: Work Simplification Applied to the Shipping Department, by Clifton H. Cox, Merck & Co.; Recent Developments in Wooden Shipping Containers, by C. D. Hudson, National Wooden Box association; Advantages and Disadvantages of Packing Material Specifications, by R. L. Beach, General Electric Co.; Progress in Packing for Shipping, by T. L. Lussen, B. F. Goodrich Co.; Reducing Packaging Costs, by Paul C. LaPierre, Anaconda Copper Mining Co., and New Container Testing Devices, by Don L. Quinn, Don L. Quinn Co. Copies may be obtained for 75 cents each from the association.

Stearns Pioneered the Magnetic Pulley

COOL Because It's Ventilated


STEEL COIL COVERS UNIFORMLY DISTRIBUTE MAGNETIC LINES OF FORCE PROVIDE GREATER COIL PROTECTION AT LESS MAINTENANCE COST
FULL DEPTH RADIATION OF MAGNETIC LINES OF FORCE BEYOND POLES
BRONZE END RINGS CONFINE MAGNETIC FIELD TO LOAD AREA OF BELT
ONE-PIECE HORSE-SHOE SHAPED MAGNET BODY MEMBER — NO JOINTS IN MAGNETIC CIRCUIT
FORCED VENTILATION AIR DUCTS FOR HIGH COOLING EFFICIENCY

Today's accepted principle of forced ventilation in Magnetic Pulleys was PIONEERED BY STEARNS ENGINEERS more than twenty years ago.

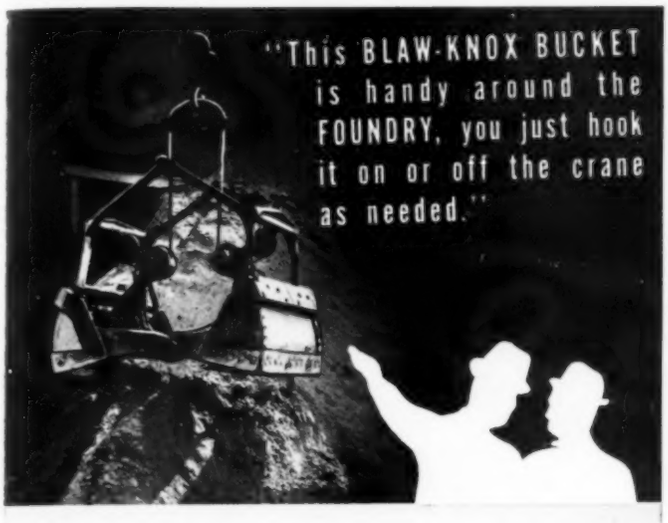
That's why Stearns Magnetic Pulleys develop 50% more pull and why this greater magnetic strength has made Stearns Magnetic Pulleys universally recognized as an outstanding product.

A positive and economical method of reclaiming iron is offered in the Stearns Magnetic Pulley installed at the end of a sand conditioning belt. It saves labor, reduces the time required to recondition sand and is automatic.

INVESTIGATE STEARNS MAGNETIC SEPARATION METHODS.
WRITE FOR BULLETIN 301

SEPARATORS — DRUMS — ROLLS
CLUTCHES — BRAKES — MAGNETS

STEARNS MAGNETIC MFG. CO.
650 So. 28th Street - Milwaukee, Wis.



Blaw-Knox Hook-On Buckets are made in two types for foundry service, the regular and the "Foundry Type" which is built especially to meet the requirement of limited head room clearance, both multiply the value of your crane investment. Ask for Catalog 1224.

BLAW-KNOX *Digging and Rehandling* **BUCKETS**

BLAW-KNOX DIVISION
• OF BLAW-KNOX CO. •
Farmers Bank Bldg. · Pittsburgh, Pa.

ESTABLISHED 1788

THE E. & G. BROOKE IRON COMPANY

◆

Manufacturers of

Basic, Malleable, Foundry, Forge and Low Phosphorus Pig Iron

◆

BIRDSBORO, PENNSYLVANIA

CLOSELY RELATED PARTNERS in SMOOTH-ON ECONOMY

SURFACE pits on only a few castings subject your entire output to criticism. Therefore, every casting should be sent out with the best surface you can give it.

Where sand holes, blow holes and slight depressions at unimportant locations harm nothing but appearance, scrapping the casting or risking complaint for so slight a fault is the height of folly.

SMOOTH-ON No. 4

applied to each blemish as a putty, hardens in one or two hours and produces a genuine metallized iron filling that has the contour, color and texture of the surrounding metal. This filling has all the essentials of originally perfect surface.

Such use of Smooth-On No. 4 is a very real help in maintaining maximum salable production—and the cost of all the Smooth-On you may need in a whole year is often repaid in reclaiming a single casting.

Three compositions, each with distinct color, degree of lustre and fineness of grain offer a choice for perfect match in iron and steel castings of any shade, appearance and quality.

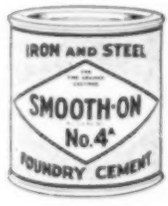
Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish

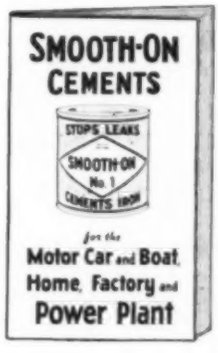
Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade

Make a critical test, and you will find your filling problems well solved.

Smooth-On Nos. 4AA, 4A and 4B is packed in 1-lb. and 5-lb. can, 25-lb. pail or 100-lb. keg. Mail coupon for prices and free hardened samples.





Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N. J.

Send Smooth-On Handbook.

Send samples of ☐ Smooth-On No. 4AA ☐ Smooth-On No. 4A ☐ Smooth-On No. 4B

Name.....

Address.....

.....

Do it with **SMOOTH-ON**

METHODS OF TESTING BONDING SAND

(*Continued from page* 30)

small samples on an as received basis against carload shipments which usually will be higher in water. The one correct method to test clay bonds is to dry each clay for 4 hours at 220 degrees Fahr. before testing.

Most bentonites and bentonitic clays absorb moisture readily from the air and such absorption is appreciable even in the first few hours of exposure. It is misleading to test such products after the usual moisture proof bags in which shipments are made have been open for any considerable period. It is good practice to test bentonitic clays on both an as received and dry basis. The tests of the dry clay give an accurate comparison of strength while the as received tests indicate the effect of the moisture content.

Quantity of clay to be used will depend upon its type. Usually 5 per cent of bentonite or bentonitic clay is used and 10 per cent of the fire clay binders. It is desirable to use such quantity as will give the strength preferred for most work in the testing foundry.

Belief is common that the addition of clay bond above some certain strength is ineffective and that excess clay is wasted. This is not correct and the reverse is true up to strengths much beyond those in use in American practice. As example, 10 per cent of clay will give more than double the strength of 5 per cent, and 15 per cent will give more than triple the strength of 5 per cent.

When a foundry uses a combination of bonding materials, such as fire clay, bentonite and cereal binder, it is best to test only one material at a time. For example, when a new clay is being tested in combination with previously used bonds, due weight must be given to the strength contributed by each of the bonding materials and such strength cannot be determined without separate tests. This is illustrated in the accompanying table on page 106.

When all materials were tested in one batch, the total strength was 40 per cent greater when clay *B* was used. This does not indicate how much stronger clay *B* was than clay *A*, but a simple test of the clays alone shows that clay *B* actually was 100 per cent stronger than clay *A*.

Compare Clay Bonds

Clay bonds may be compared by hand mixing or by the use of any type machine mixer. Highest efficiency from the clay bond and more accurate results are secured where the material is prepared in muller type mixers. The mixer should be clean and dry with no traces of oil from previous core sand mixtures.

Principal point in mixing is that each comparative batch be mixed exactly the same length of time. Some clay bonds develop strength faster than others. In comparative tests, mixing should be for the same length of time as prevails for the usual batch in the foundry. This will give the results to be expected in practice rather than an arbitrary comparison on a longer or shorter mixing cycle than will be used under operating conditions.

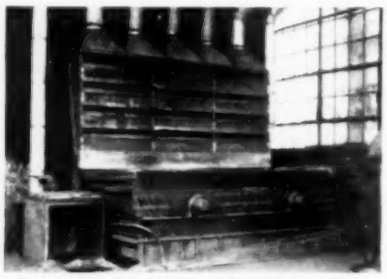
The most common source of error in testing clay bonds lies in the amount of tempering water added. Bentonites and bentonitic clays reach proper feel and moldable condition at slightly lower water content than do the fire clay binders. All synthetic sands are at proper feel and moldable condition at much lower water content than naturally bonded sands. When comparing such dissimilar materials the bonds or sands can be tempered to proper feel and relative values established

(*Continued on page* 106)

THE MEN TOOK 80 HOURS
THE SIMPLICITY TAKES 7 MINUTES

Simplicity units are chalking up records for amazing savings all over the country. A large Ohio foundry producing an 18-ton casting had required 80 man hours for cleaning. After installing an 8'x 10' dual Simplicity Shakeout they now clean the same casting in 7 minutes.

A large Illinois foundry formerly required 27 man hours to clean a casting weighing 16 to 20 tons. They installed a Simplicity Knockout and now clean the same casting in 7 minutes.



Simplicity 5'x 13' Dual Knockout with dust-collection panel.

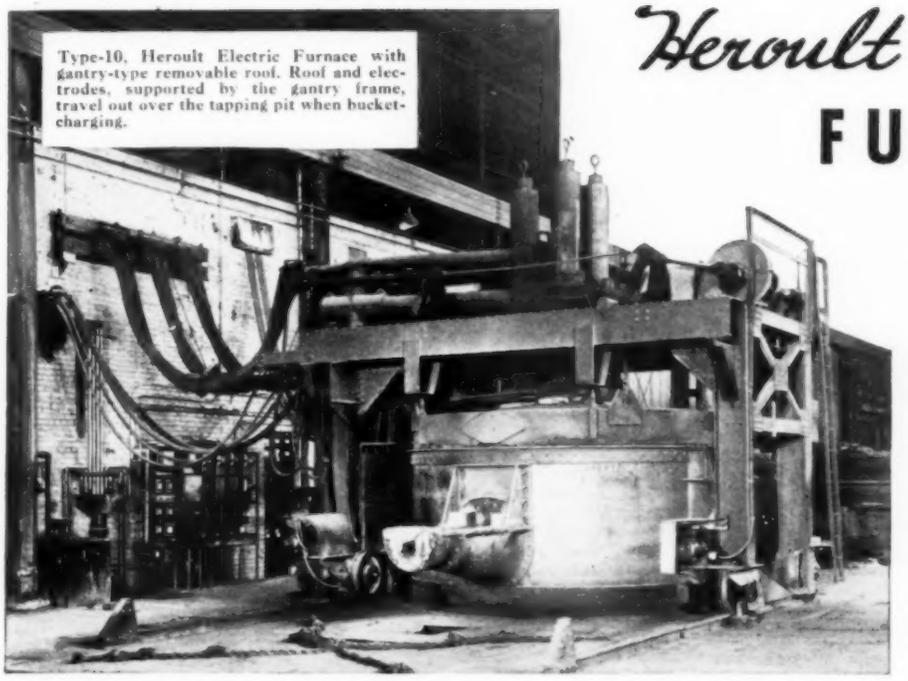
95% of all shakeouts sold in the last 4 years have been Simplicitiys. You, too, can greatly reduce your cleaning time by installing a Simplicity Shakeout unit. Send a postcard now, asking for proof of how a Simplicity will pay you.

REDUCE SCRAP LOSSES

No matter how many floors you operate, a Simplicity portable or semi-portable sand screening unit will prove to be a profitable investment in your foundry. In one operation they screen, aerate and fluff heap sand and facing sand. They greatly reduce scrap-casting losses and moulding time by insuring a perfect sand. Write for complete facts and prices.

Simplicity

ENGINEERING COMPANY · DURAND MICH.



Type-10, Heroult Electric Furnace with gantry-type removable roof. Roof and electrodes, supported by the gantry frame, travel out over the tapping pit when bucket-charging.

Heroult ELECTRIC FURNACES

AMERICAN Bridge Company offers an improved series of Heroult type electric furnaces especially designed for effective melting and refining of ferrous materials, and particularly suited to produce high-grade alloy and stainless steels, iron or steel castings.

Heroult Furnaces are sturdily built, and equipped with the most modern electrical and mechanical appliances for efficient, economical and safe operation. Dependent on size and operating conditions, they are adaptable to hand, chute, machine or overhead drop-bottom bucket charging. Available capacities range from ½ to 100 tons.

You are invited to call freely upon the specialized experience of our furnace engineers.

AMERICAN BRIDGE COMPANY

General Offices: Pittsburgh, Pa.

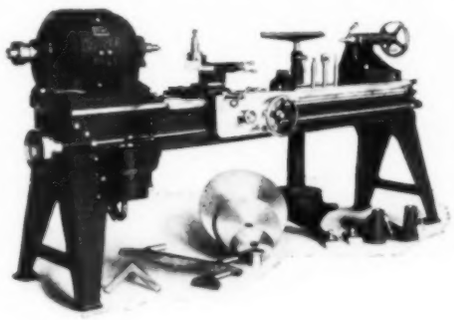
Offices in New York, Philadelphia, Chicago and other principal cities.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

THE LATHE

FOR PATTERN MAKERS



Here's the "Oliver" Motor Head Pattern Lathe—the pattern maker's choice. Although this is the most popular lathe because it's built in 16", 20", 24" and 30" sizes, it is just one member of the "Oliver" line of Pattern Makers Lathes.

Other types in sizes from 8" to 96 inches. The biggest line including the biggest lathes for pattern work. Write for descriptive circulars.

Oliver Machinery Company
Grand Rapids, Michigan, U.S.A.

"ADJUSTABLE" RADIUS CHILLS? YES, THEY ARE HERE!

They can easily be given a *REAR*, *FRONT* or *DOUBLE* bend.

They can be given a *RIGHT*, *LEFT* or *DOUBLE* twist.

They can be given any *DESIRED RADII* 6" or *LARGER* in any direction.

They can be *BROKEN OFF* at 1" points to provide any length required.

They will *REDUCE* your *STOCK REQUIREMENTS* to a *MINIMUM*.

They can be *FORMED* around the pattern.

Patent applied for

MILWAUKEE CHAPLET & MFG. CO.
1023 South 40th St. Milwaukee, Wis.

at such water content. The test report shows the amount of water used.

Most errors are made in testing similar materials. There is a common belief that each clay bond will reach peak strength at one particular moisture and that it is necessary to determine such moisture. This belief has some foundation in the case of high percentages of clay bond added to very coarse sands. In the finer synthetic sands used for most gray iron, malleable and light steel castings, the peak strength is reached at a moisture content below the moldable range and the feature does not have much practical importance.

The stronger a clay bond, the more moisture it will absorb. In comparing two similar clay bonds it is usual to test the regularly used product first. When the same amount of tempering water is added to the same quantity of a stronger clay, the resultant sand feels much dryer. It is stronger, and the test properly registers such higher strength. The logical and proper conclusion is that the quantity of stronger clay can be reduced so that the strength will be the same as with the regular clay and so that the stronger clay will have the same feel as the regular, when the required lesser quantity is used.

Frequently the foundryman, noting that the sand feels dryer, continues to add water until the new mixture feels the same as his regular mixture, thus destroying the greater strength which he was attempting to measure. In testing similar bonding materials it is essential to use the same amount of tempering water for each. Emphasis should be placed upon this point since it is the most common error made in testing clay bonds and an error astonishingly frequent even in the best foundries. It is an error that substantially may increase clay bond costs.

Materials Affect Final Strength

	Strength from each bonding material		Strength from each bonding material
4 parts Clay A	2	4 parts Clay B	4
2 parts Bentonite	2	2 parts Bentonite	2
1 part Cereal	1	1 part Cereal	1
Total Strength from all Bonding Materials	5		7

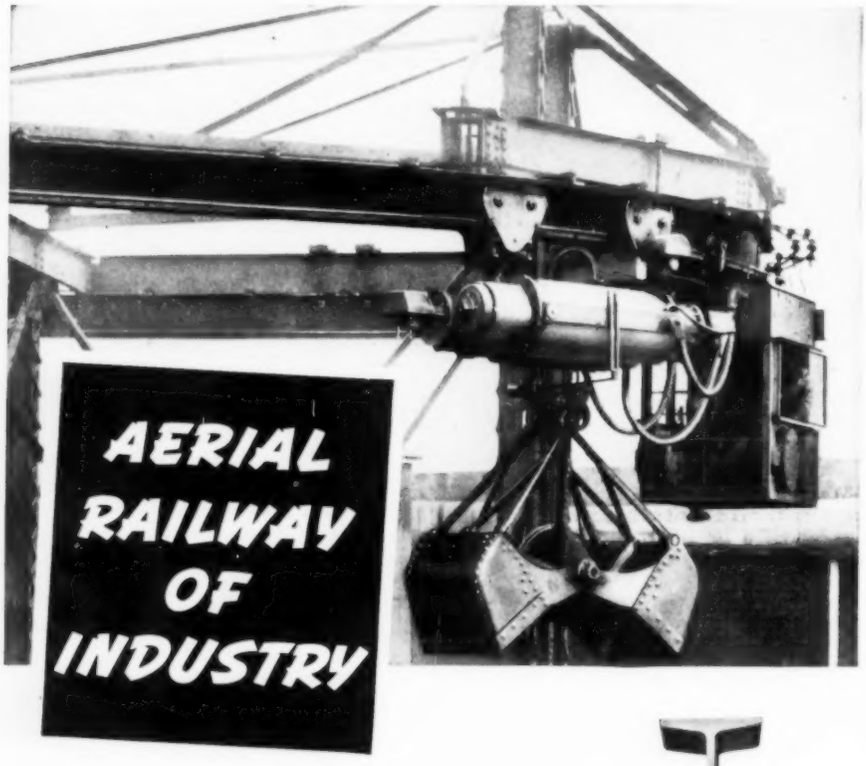
Favor Lower Water Content

Many foundries use too much bond clay because they have not experimented to see if a lesser quantity would be adequate. If a foundryman adds 10 per cent clay bond to each batch of facing and finds it necessary to use 4 per cent water to make the mixture workable at proper feel, he should realize that 8 per cent of clay at 3.25 per cent water might give the same strength, the same feel and the advantages of lower water content.

The dryer a synthetic sand is the stronger it will be. Some very open test sands dry out quite rapidly and it is important that the samples be put in air tight containers as soon as mixing is completed and while awaiting testing or the production of further samples.

It is better practice to ram up and test one sample at a time than to prepare several before testing. If a number of samples are rammed at one time and then tested in the order made, it will be found that the first one or two will test higher

(*Concluded on page* 109)



• One Shepard Niles electric monorail hoist gives "express service", indoors or out to any point in the plant or yard carrying loads of every description. Furnished with single or double hooks in capacities from ⅛ to 10 tons.

They are also ideally suited to the accurate control of any standard electromagnet or grab bucket.

Write for catalogs illustrating and describing the "Aerial Railway of Industry".

Shepard Track consisting of two special analysis T-rails clamped to the bottom flange of a standard I-beam insures a smooth, hard, long-wearing track for monorail hoists.

A COMPLETE LINE OF CRANES & HOISTS

SHEPARD NILES CRANE & HOIST CORP.

360 SCHUYLER AVENUE . . . MONTOUR FALLS, N. Y.

Have You Seen This

HELPFUL LITERATURE?

Here are the latest industrial publications reviewed for your benefit. They are yours for the asking. There is no charge or obligation. Simply fill in one of the attached post cards and return.

1—Patternmaking

Kindt-Collins Co.—95-page indexed catalog "L" covers wide range of pattern shop equipment, materials and subjects. Includes suggestions for wood and metal pattern shops such as information on rejuvenating abrasive discs, how to make match plates, directions for plaster castings, etc.

2—Motors

Century Electric Co.—12-page illustrated booklet No. 938-A describes repulsion start, induction brush lifting, single phase motors. Construction details and specifications given.

3—Nickel Alloys

International Nickel Co.—16-page booklet gives technical and mechanical data on nickel, monel, inconel, and other nickel alloys used for parts under service conditions where ordinary materials might fail. Problems of heat resistance, resistance to vibration and corrosion, wear, etc., covered.

4—Sandcutters

American Foundry Equipment Co. —12-page catalog No. 25 describes and illustrates mechanical features, specifications and models. Other types of foundry equipment made by the company illustrated and briefly described.

5—Goggles

American Optical Co. — Illustrated Folder No. TL-135A gives instructions for fitting goggles to workers, suggestions on care and use of goggles.

6—Dust Control

Pangborn Corp. — Illustrated folders Nos. 2045 and 2046 describe construction and application of concern's cloth screen dust collectors in representative foundries.

7—Slip Flasks

Adams Co. — Circular No. C-806 describes aluminum slip flasks. Construction details covered, including illustrations of concern's steel, cast iron and aluminum jackets.

8—Die Castings

New Jersey Zinc Co.—24-page booklet discusses commercial machining of zinc alloy die castings and covers bonding, forming, drilling, gear cutting, milling, reaming, threading, etc.

9—Blowers

Roots-Connersville Blower Corp. — 20-page illustrated bulletin No. 120-B-11 describes single and multi-stage centrifugal blowers and exhausters. Information regarding pressure volume and operating characteristics given.

10—Aftercoolers

Pennsylvania Pump & Compressor Co.—8-page bulletin No. 186 illustrates and discusses cooling of air or gas immediately after it has been compressed. Construction and operating details, sizes and capacities given.

11—Pulverizers

Jeffrey Mfg. Co. — 32-page illustrated catalog No. 710 covers various models of concern's swing hammer pulverizers and crushers. Construction details explained, applications and specifications given.

12—Flexible Coupling

Morse Chain Co. — 32-page bulletin No. 57 contains engineering data, installation and operating information, together with recommended applications of flexible couplings, silent and roller chain couplings, etc.

13—Vacuum Cleaning

Breuer Electric Mfg. Co. — 4-page folder illustrates and describes concern's portable industrial vacuum cleaner and standard attachments.

14—Telephone Booths

Burgess Battery Co. — Folder explains accoustical telephone booths designed for factory locations to control and dampen extraneous noises.

THE FOUNDRY

Readers' Service Dept.
1213 West Third St.,
Cleveland, Ohio

DECEMBER
1939

Send me the literature I have circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Name _____

Company _____ Title _____

Address _____

City _____ State _____

This card must be completely filled out.

FIRST CLASS
PERMIT No. 36
(Sec. 510 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

2c POSTAGE WILL BE PAID BY—

THE FOUNDRY
Penton Building
CLEVELAND, OHIO

Readers' Service Dept.

15—Core Ovens

Paul Maehler Co.—Bulletin No. 21 illustrates and describes concern's core ovens and discusses the principles of core oven construction.

16—Wire Rope Clamps

National Production Co. — Illustrated price folder describes concern's wire rope clamp for eliminating splicing and serving. Construction and method of assembly shown.

17—Gages

Brown Instrument Co. — 8-page booklet No. 2-17 illustrates and describes new thermometers and pressure gages in vapor, gas, and mercury-actuated types.

18—Welding Equipment

Wilson Welder and Metals Co.—18-page bulletin No. ADW-15 describes operating and construction details of new electric arc welding generator. Alternating current, direct current and pipe line welders also described.

19—Air Coolers

Griscom-Russell Co. — 8-page illustrated bulletin No. 1219 describes new finned-type units for cooling air or hydrogen circulating through generator windings, and for cooling high temperature gases from annealing furnaces, preheating air for boilers, furnaces, heating systems, etc.

20—Molybdenum

Climax Molybdenum Co. — 28-page booklet deals with applications of molybdenum in cast iron and steel. Information given on the affect of additions of molybdenum alone and in combination with other alloy agents. Featured are seven questions to aid in selection of a suitable composition of iron for specific jobs.

21—Sand Conditioners

Royer Foundry & Machine Co.—24-page catalog covers various models of sand conditioners, blenders, combination scrap remover-conditioners, and shake-outs, portable and stationary.

22—Safety Clothing

Industrial Gloves Co. — Folder describes and illustrates line of gloves, mittens, hand pads, arm protectors, leggings, aprons, sleeves, straps, welders' clothing in leather, asbestos and fireproof duck.

23—Lathes

South Bend Lathe Works—112-page catalog No. 100 illustrates and describes numerous lathes for production, tool room, and general shop work. Sizes shown in several different models with motor and countershaft drives.

24—Paint

B. F. Goodrich Co.—4-page catalog section No. 9770 describes acid seal protective coatings derived from rubber for use where resistance to corrosion, strong adhesion and elasticity are desired.

25—Oilless Bearings

R. W. Rhoades Metaline Co.—16-page catalog No. 4 describes and illustrates function and use of oilless bearings, metaline plates and disks. Table of sizes, specifications and installation instructions given.

26—Flame Cleaning

Air Reduction Sales Co. — 8-page illustrated booklet No. ADG-1066 discusses use of flame cleaning and dehydrating process to halt deterioration. Includes suggested specifications for various surfaces of metals and recommends procedure.

27—Graphite

United States Graphite Co.—12-page folder discusses company's No. 8 Mexican graphite for chill control, machinability, carbon pick-up and hardness reduction.

28—Bronze Bearings

Johnson Bronze Co. — Slide rule for the engineer and designer lists wide range of bearing sizes to facilitate the selection of size by standard number.

29—Refractories

Lava Crucible Co. — 16-page illustrated catalog describes concern's crystalline heavy duty refractories. Includes "problem analysis" questionnaire and chart to assist in the selection of refractory cements.

30—Chain Drives

Whitney Chain and Mfg. Co.—64-page catalog No. V-135 covers chain construction, its application to various industries and specifications to aid in the selection of proper chains for specific applications.

31—Grinders

Sawyer Electric Mfg. Co. — 15-page catalog No. A-39 covers line of portable aerial grinders, hi-speed, heavy duty two post and pedestal mounted models. Information also given on pressure blowers, volume blowers, submersible pumps, and sanders.

32—Shakeouts

Simplicity Engineering Co.—Illustrated 8-page bulletin No. F-3 describes concern's line of gyrating shakeouts and knock-outs for use in production and jobbing foundries on both large and small work. Also gyrating sand screens in portable and stationary types for screening foundry sands.

THE FOUNDRY

Readers' Service Dept.
1213 West Third St.,
Cleveland, Ohio

DECEMBER
1939

Send me the literature I have circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Name _____

Company _____ Title _____

Address _____

City _____ State _____

This card must be completely filled out.

FIRST CLASS
PERMIT No. 36
(Sec. 510 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

2c POSTAGE WILL BE PAID BY—

THE FOUNDRY
Penton Building
CLEVELAND, OHIO

Readers' Service Dept.

(*Concluded from page* 106)

in green strength than the last few. This is true even when samples have been exposed for only a few minutes. The actual moisture loss in such cases is so small it hardly can be determined but the effect on strength is evident, particularly in hot weather.

In baking specimens for dry strength it is essential that a heavy straight plate be used to support the samples. Many complaints as to wide variations in results are due to using light steel pans which have become warped and dented. If loose sand remains on the plate when the sample is picked up for testing, it usually is evidence of distortion of the plate during heating. Results will be erratic. In a recent series of tests, using a light warped pan, dry strength varied from 35 pounds to 85 pounds compression. Sand from the same mixture when dried on a heavy flat plate gave six specimens averaging 83 pounds dry compression with a maximum variation of 6 per cent.

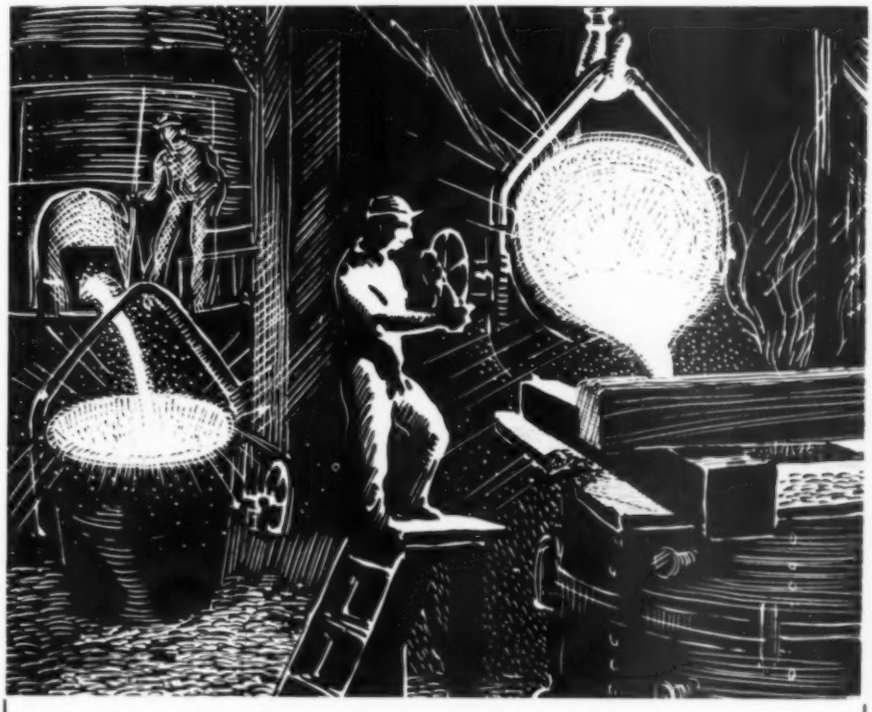
For correct results it is important that test specimens be almost exactly 2 inches in length. Many old ramming posts still in use indicate an allowable tolerance of 1/16-inch. The revised test procedure allows a tolerance of only 1/32-inch. The first specimen should be weighed to give a sample of almost exactly 2 inches and subsequent samples made to same weight instead of filling the tube by guess in attempt to reach the correct length.

The correct testing of clay bonds, as described, sounds like and is a rather long and inconvenient procedure. This fact leads to the adoption of short cuts to save time. These short cuts almost invariably lead to incorrect results. Since incorrect results are worthless, short cuts may be considered to waste time instead of saving it.

Book Review

Welding of Cast Iron by the Oxy-acetylene Process, by L. Tibbenham; cloth; 88 pages 5 x 7½ inches; published by Sir Isaac Pitman & Sons Ltd., London; available through THE FOUNDRY, Cleveland, for $1.60.

This book deals in a practical way with details of the process of welding cast iron by the use of oxy-acetylene. Written with the object of instructing the welder in this single process, no attempt has been made to describe any other method. The text is supplemented by 45 illustrations and with a two page double column index. The work is presented under seven chapter headings. Chapter I deals with properties of cast iron; malleable iron; white iron; burnt iron; high tensile iron; nickel iron; grain growth; thermal expansion internal cracks. Chapter II covers preheating methods welding technique; causes of failure; angle of blowpipe; repairing castings from foundry view point; reclamation of auto castings. Chapter III is devoted to gases; hydrogen; menthane; coal gas; gasoline; acetylene; calcium carbide; acetylene flame; types of flames; oxygen. Chapter IV discusses low pressure; high pressure; generators, automatic, portable, American and continental; purifiers; back pressure valves; regulators; blowpipes; leftward and rightward technique. Chapter V takes up chemical analysis; various sections; silicon content; analysis of various cast irons; fluxes. Technique and welding procedure and applications of the process are described in Chapter VI. The final chapter is devoted to bronze welding, preparation of the weld, analysis of the rods, welding heat, method of welding; suitable flame; importance of flux and tinning; flux coated rods; high duty bronze welding rods.



Announcing

SLOSS FERROMANGANESE

IN CARLOAD LOTS FOR FOUNDRIES

A brand new service for both steel foundries and cast iron foundries — Sloss Standard Ferromanganese, 78 82%.

Special facilities for handling both carload and LCL orders.

Sloss Ferromanganese is highest quality — a dependable supply for immediate delivery. Inquiries solicited.

Address Sloss-Sheffield Steel & Iron Company, Birmingham, Alabama.

SHIRT SLEEVE SERVICE

SLOSS

SPECIALISTS IN IRON ORE SMELTING SINCE 1882

AVOID DEFECTS IN NONFERROUS FOUNDRY

(*Continued from page* 32)

co-operate to cause trouble. A defect that looks as though it were caused by one of these reasons may be the result of one of the other reasons or possibly two or more. Frequently it is very difficult to assign a given defect definitely to its correct cause or causes. Experience, of course, does educate one in this problem. Research also has uncovered many things that heretofore have been assumed. As a matter of fact a very different explanation frequently has been developed by research methods.

Pattern equipment, a very important factor in the elimination of defects, must be designed by those who understand the casting of the specific material or composition from which the castings are to be made. A pattern designed for the production of cast iron rarely if ever is serviceable in the production of good castings economically in the brass foundry. Many castings are made in the brass foundry from patterns originally produced for use in the iron foundry, but these patterns have been used at a cost figure in most instances that would have been reduced had the patterns been originally prepared for use in the brass foundry.

This is not alone explained by the shrinkage of the two metals. Other problems connected with the production of brass and bronze castings are taken care of more satisfactorily by patterns designed for use in the production of those specific alloys.

Pattern equipment designed to produce one or two castings may be of one design. Pattern equipment worked out to produce castings on a mass production basis, very definitely should be considered most carefully from all angles. The design should be carried out to the highest degree of perfection, with proper provision for gates in the mold and ease of removal of these gates in the cleaning room. Careful thought should be given to ease of handling patterns by molders, coremakers and other labor intimately connected with the production of castings in the foundry. Pattern equipment to produce a number of castings should be made of materials that will withstand wear, and thus insure the maintenance of accuracy of fit of all parts even under the trying conditions of foundry operation.

Prefer Metal Coreboxes

Metal coreboxes are preferred and should be designed to lend themselves to the most rapid production of cores. If used on a blowing machine, the corebox should be designed for that method of core making. If the cores require wires, rods, crabs, arbors or mandrels, provision in the corebox must be made for the proper location of these at the most economical stage so that the cores may be produced with minimum expense.

Pattern equipment should be considered carefully in relation to the number of castings to be produced, alloy from which the castings are to be made, and the influence that the equipment may have on defects. Shrinkage cavities appear where the patterns do not permit proper location of risers. Blow holes in many instances result from patterns designed in a manner that shuts off the proper escape of gases developed by the hot metal.

Blows from cores are found where the pattern equipment does not provide adequate venting possibilities, or where the corebox construction prevents uniform ramming of the sand. Defects may be due to lack of proper core anchorage where the

(*Concluded on page* 112)

5 ADVANTAGES OF TRUSCON STEEL FLASKS

1-**DURABILITY:** Truscon Flasks are made of one piece of steel.
2-**RUST-RESISTING:** Truscon Flasks are made of copper-bearing steel which resists rust and corrosion.
3-**STRENGTH:** Deep ribs and flanges extend full depth all around for maximum rigidity. This gives great strength with light weight, thereby reducing handling costs.
4-**ANY SIZE, SHAPE AND THICKNESS** of flasks can be furnished due to Truscon principles of design.
5-**ECONOMY:** Improved and enlarged manufacturing facilities reduce production costs. Savings reflected in lower prices to customers than would be possible otherwise.

• *Send for complete catalog of Truscon Foundry Flasks which illustrates many standard types available for immediate shipment.*

TRUSCON STEEL COMPANY • FOUNDRY FLASK DIVISION
6100 TRUSCON AVENUE • CLEVELAND, OHIO
Subsidiary: Republic Steel Corporation

TRUSCON

COPPER-BEARING STEEL FOUNDRY FLASKS

He'll save your MONEY!

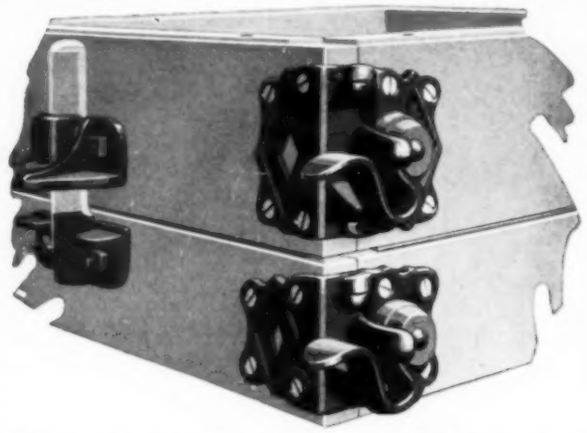
Here's ONE nozzle that brings substantial sums of money back to his user. He saves on air consumption and he saves on production. No waste labor time "changin' nozzles." Inside diameter of the PANGBORN-NORBIDE* Blast Cleaning Nozzle stays "to size" longer than any other nozzle. His lining of Boron Carbide is the hardest commercial substance made by man.

*Trade Mark of Norton Co. for Boron Carbide

GUARANTEE
1500 HOURS WITH STEEL ABRASIVE
750 HOURS WITH SAND

There's a style and size for every need.

PANGBORN CORPORATION
The World's Largest Manufacturer of Blast Cleaning and Dust Collecting Equipment
HAGERSTOWN · · · · MARYLAND



Diamond Snap Flasks

STEEL SLIP JACKETS
STEEL BANDS
STEEL CORE PLATES
STEEL BOTTOM PLATES
WOOD CORE BOXES
HARD WOOD WEDGES

Reliable Products Sold Extensively to Foundries for Fifty Years

DIAMOND CLAMP & FLASK CO.
Telephone 2553
RICHMOND, INDIANA

MOISTURE—PERMEABILITY

Moisture Teller

Sand Rammer

Permeability Meter

Prepare molding and core sands to predetermined moisture and permeability and save castings.

STRENGTH — DEFORMATION — FINENESS

Strength Machine

Sand Washer

Sieves and Sifter

Measure the strength and deformation of molding sand to determine workability. Control fineness for permeability and casting finish.

Carbon Determinator

MODERN ANALYSIS

Accurate carbon determinations made in two minutes with the Carbon Determinator.

Accurate sulphur determinations made in two minutes with the Sulphur Determinator.

Accurate spectrographic analysis of metals in eight minutes.

Speed up your laboratory to obtain chemical control in step with production that will pay dividends immediately.

MOLTEN METAL TEMPERATURE

Ferrotemp

Accurate temperature determination of molten iron and nonferrous metal in ladles by immersion pyrometer. Range from room temperature to 3100° F.

Economical in cost and in use. Time required for reading 45 seconds.

Write to us for

SAND TESTING — FERROTEMP — SPECTROGRAPH
QUICK CARBON DETERMINATOR—QUICK SULPHUR DETERMINATOR

HARRY W. DIETERT CO.
9330 Roselawn Ave.
DETROIT, MICH.

(*Concluded from page* 110)

pattern equipment lacks proper size core prints. Defects from misalignment of cores and castings result from errors in pattern equipment due to warpage of patterns, or to careless production of patterns designed to save the first cost of construction. Blisters or scabs on the castings may be caused by damage to the mold resulting from an inadequate amount of draft on the patterns or roughness of pattern surface on "cheap" pattern work.

Other types of defects may be traced to the pattern equipment, or to a combination of the pattern equipment and some other cause. Mold equipment has a definite influence on the quality of the resulting casting. Inadequate apparatus with which to handle the molds is a cause for defective castings and for high molding cost. Flasks that warp or weave invariably prevent the foundryman from reducing molding cost and casting defects. Flasks pins, with a certain amount of play that prevents accurate assembly of the molds, result in defective castings in many instances.

Bottom boards, match plates, and the hundred and one other items comprising molding equipment, must be maintained at their best. Design should be scrutinized carefully to insure accuracy and uniform operation. Sand holes in the castings frequently are traceable to the molding equipment which caused cracking or distortion of the mold. Sand is loosened and washed into the casting cavity where it produces a defect in the casting.

In connection with molding equipment, adequate illumination might be considered an item of equipment overlooked in many foundries. This question of illumination exerts a definite influence in the production of good or defective castings. Good castings will result from good equipment operated under good conditions of illumination. The reverse is bound to be the result under poor illumination, particularly if low illumination is combined with inadequate or faulty equipment.

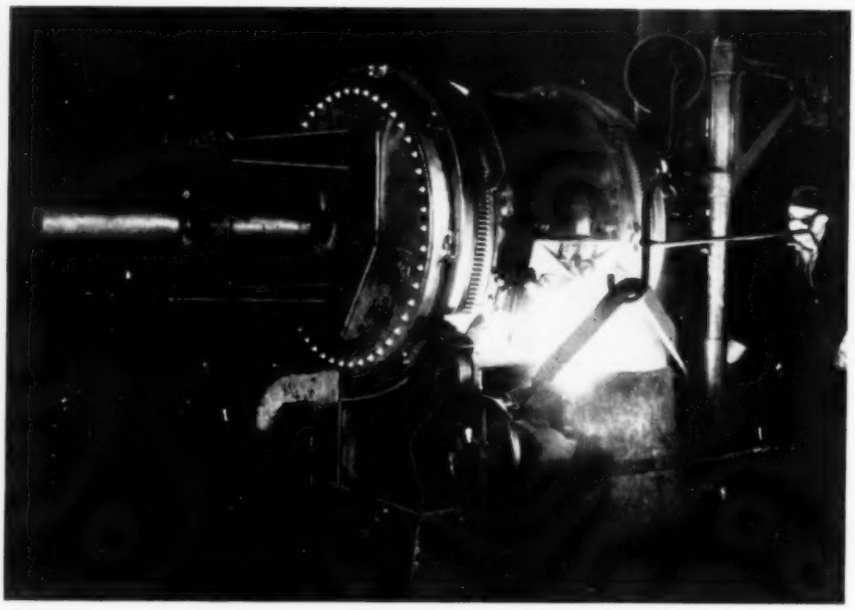
Set Molds Correctly

Mold setting is a definite cause of defects. To state it in another way, good castings are produced best by proper setting of the molds. Many of the nonferrous alloys lend themselves best to the production of good castings where the metal enters the mold at a low point and runs uphill. The molds must be set in a manner to meet this condition. Setting molds in this way entails the proper support. There must be no distortion or harm to the molds through inadequate support, jarring or other mechanical sources, or injury to the molds before or during the casting process. Sudden jarring of the mold as the molder places it on a carrier or on the molding bench after it is ready for pouring is a common source of injury to an otherwise good mold.

The problem of setting cores in the molds must be considered carefully and well planned if the best results are to be obtained. To set a large number of small cores in a mold of course is an expensive operation unless the equipment is designed to make this a simple quick step. Cores must fit accurately and cause absolutely no damage to an otherwise perfect mold. Blowing out a mold or removing the loose sand resulting from dropping cores into the prints means an increase in the cost of production. This feature should be anticipated by the provision of an easy method of setting the cores that will not produce loose sand. Obvious defects to be expected from the lack of provision of this kind are sand holes and blow holes resulting from vents closed by loose particles of sand.

This is the first of a series of articles covering the causes of defects in nonferrous castings, with suggestive corrective and remedial measures. The second section will appear in an early issue.

THE EDITORS



Faster Cheaper Melting

The Detroit Rocking Electric Furnace does a faster, cheaper, more accurate job of melting. Cheaper raw materials can be used without impairing the quality of the product. Any size heat is practical. It adapts itself to widely fluctuating production schedules of different alloys any desired number of hours per day. Any type of charge can be run. Through its automatic rocking action and its ability to melt any desired alloy under close control of time temperature and composition, a Detroit Electric Furnace produces a uniformly superior product and a higher percentage yield of perfect castings. Because of its many inherent economies the Detroit Furnace assures a maximum return on its investment — ask the man who uses one.

DETROIT
ROCKING ELECTRIC FURNACE
DIVISION OF KUHLMAN ELECTRIC CO., BAY CITY, MICH. AGENTS IN 40 CITIES

AMERICAN STEEL ABRASIVES
Can Take It! . . .

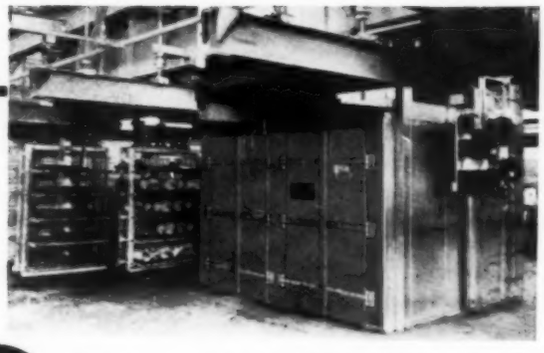
● Certainly, American Standardized Steel Shot and American Eversharp Steel Grit can take it, because they are manufactured to do your blast or centrifugal force cleaning job most economically.

"American" Steel Abrasives are skillfully and scientifically heat treated by a rigidly controlled heat treating method that assures uniformity in every grain of material. This rigid heat treatment reflects in a great amount of cleaning accomplished per pound of steel abrasive used.

If your cleaning room is not among the hundreds that is using "American" it would pay you to write for further information.

"The Steel Abrasive that is Heat Treated"

THE AMERICAN STEEL ABRASIVES COMPANY
GALION OHIO



COLEMAN
CORE AND MOLD OVENS

This battery of two Coleman mono-rail type core ovens was designed to meet the requirements of The Standard Stoker Company, Inc., Erie, Pa. This customer reports fine uniformity and a considerably shorter bake than with former equipment.

Coleman Ovens quickly pay for themselves wherever they are installed. Coleman engineers will gladly recommend the best type ovens to handle your work dependably at the lowest possible cost for fuel and labor.

Why waste money with obsolete baking equipment?

WRITE FOR COMPLETE CATALOGS

The FOUNDRY EQUIPMENT CO.
• COLEMAN AND SWARTWOUT OVENS •
CLEVELAND, OHIO

Merry Christmas
may this holiday season be the best ever for you and yours.
Quality Chaplets
CLEVELAND CHAPLET & MFG. CO.,
W. 67th St. and N.Y.C. Ry., CLEVELAND, OHIO
ALL TYPES AND SIZES
Since 1890

FOUNDRY ACTIVITIES

GENERAL MALLEABLE CORP., Waukesha, Wis., recently put into operation a continuous annealing furnace. The furnace is 70 feet long, 12 feet wide, and 13 feet high. It was installed by Helcroft & Co., Detroit. Annealing cycle of the furnace is less than 30½ hours.

* * *

Symington-Gould Corp., Rochester, N. Y., has dissolved its wholly owned subsidiary, the Gould Coupler Corp. The Symington-Gould Corp. will carry on the business of Gould and will operate the Gould Coupler Works at Depew in conjunction with the works at Rochester.

* * *

Forest City Foundries Co., Cleveland, manufacturers of Niagara gas fired furnaces and air conditioning units, is adding 10,000 square feet of floor space to its West Twenty-seventh street plant. The new building will be occupied by the sheet metal department of the furnace division.

* * *

American Steel Foundries Inc., has opened its East St. Louis, Ill. works. L. C. Farquhar is works manager.

* * *

American Brake Shoe & Foundry Co., 2001 to 2045 Laurens street, Baltimore, plans alterations to its plant.

* * *

Chorlton Iron Foundry, Swansea, Mass., was damaged to the extent of $10,000 by a fire recently. The foundry specializes in iron, brass and bronze castings.

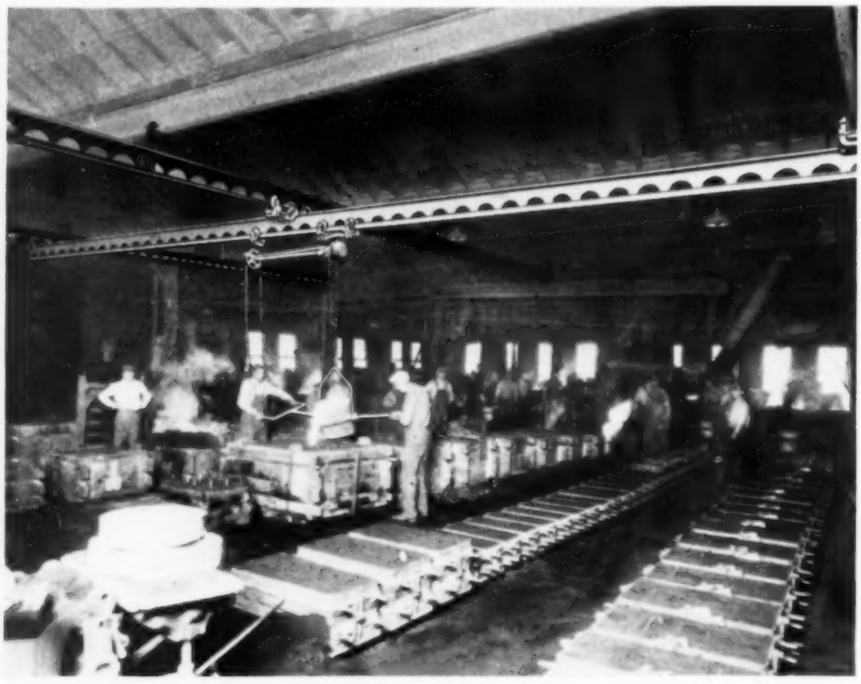
* * *

Building permit has been issued for construction of a foundry building for Kay-Brunner Steel Products Inc., 999 South Meridian avenue, Alhambra, Calif., at a cost of $3700.

* * *

Index of foundry equipment orders for October, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 220.4 as compared with 184.4 in September and 87.9 in Oc-

(Concluded on page 116)

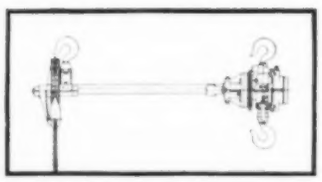


MOVE LADLES DIRECT FROM CUPOLA TO POURING FLOOR

With a Cleveland Tramrail System, complete floor coverage is obtained and ladles moved directly from cupola to pouring floor without rehandling.

Production time is far less and work easier. Spilled metal is greatly reduced.

For a small outlay you too can enjoy the advantages of Cleveland Tramrail.



Cleveland Tramrail hook-on type extended hand-wheel chain hoist. Available for capacities of ¼ to 5 ton, with any hand-wheel extension desired and for any lift.

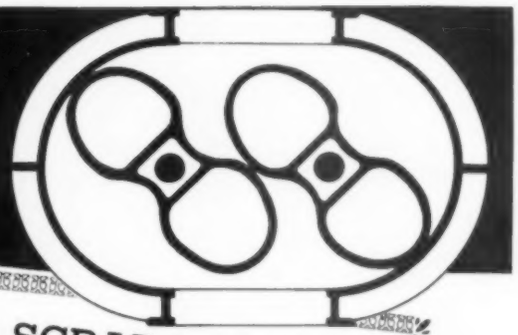
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1155 Depot Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

RAW MATERIAL PRICES
Nov. 15, 1939

Iron	
No. 2 foundry, Valley	$23.00
No. 2 Southern Birmingham	19.00
No. 2 foundry, Chicago	23.00
No. 2 foundry, Buffalo	23.00
Basic, Buffalo	22.00
Basic, Valley	22.50
Malleable, Chicago	23.00
Malleable, Buffalo	23.50
Charcoal iron, furnace	27.00
Coke	
Connellsville beehive premium	$6.00 to $6.50
Wise county beehive coke	5.00 to 5.25
Detroit by-product delivered	11.00
Scrap	
Heavy melting steel, Valley, No. 2	$19.00 to $19.50
Heavy melting steel, Pittsburgh, No. 2	19.00 to 19.50
Heavy melting steel, Chicago, Auto No. 2	14.50 to 15.00
Stove plate, Buffalo	15.00 to 15.50
Stove plate, Chicago	11.50 to 12.00
No. 1 cast, mchy., New York	16.50 to 17.00
No. 1 cast, mchy., Chicago	15.50 to 16.00
No. 1 cast, Pittsburgh	21.00 to 21.50
No. 1 cast, Philadelphia	22.00 to 23.00
No. 1 cast, Birmingham	15.50 to 16.00
Car wheels, iron, Pittsburgh	21.00 to 21.50
Car wheels, iron, Chicago	17.50 to 18.00
Railroad malleable, Chicago	19.50 to 20.00
Malleable, Buffalo	21.50 to 22.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	12.75
Straits tin	51.00
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	15.00 to 15.25
Lead, New York	5.35
Antimony, New York	14.00
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	6.50

BLOWER DIVIDENDS *for foundrymen*



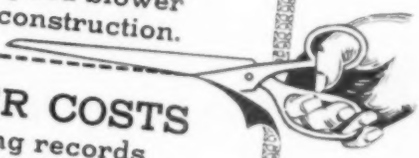
A BLOWER that puts air through the cupola wind box in accurately measured volume—and at the exact pressure required to overcome varying resistance in passing through the charge—permits the accurate control that results in definite savings in fuel and lowered scrap losses. Roots-Connersville blowers for years have been banking these dividends for many foundrymen. They are a more important source of operating profit today than ever before.

LOWER SCRAP LOSSES
resulting from iron at "just right" casting temperatures.

SAVINGS IN COKE
because none is wasted where air is accurately controlled.

LESS MAINTENANCE
required by a low speed blower of simple, rugged construction.

LOWER POWER COSTS
proved by operating records of hundreds of installations.



Roots CONNERSVILLE BLOWER CORP.
912 Madison Ave.
Connersville, Indiana

GLUTRIN

"Don't Accept A Substitute"

GOULAC

Carried in stock by the leading Foundry Supply Jobbers.

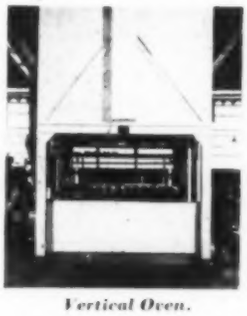
ROBESON PROCESS COMPANY
AMERICAN GUM PRODUCTS COMPANY

General Offices:
500 Fifth Ave., New York City

CARLOAD SHIPMENTS:
GLUTRIN . . from AuSable Forks, N.Y. and Erie, Pa.
GOULAC . . from Erie, Pa.

Dependable Results!

The safe and sure way to get better results in core and mold baking, is to turn to Carl-Mayer for your oven equipment. Carl-Mayer design embodies unique engineered features that have resulted in many noteworthy installations.



Vertical Oven.

OVER 20 YEARS EXPERIENCE

CARL-MAYER
Core and mold Ovens
(ALL TYPES)

The CARL-MAYER Corp.
3030 Euclid Ave., CLEVELAND, OHIO.

(*Concluded from page* 114)
tober, 1938. Index of shipments was 170.7 as compared with 132.6 in September, and 93.4 in October, 1938.

* * *

Enardo Mfg. Co., Tulsa, Okla., recently has completed construction of two new buildings. The company manufactures nonferrous castings and vapor control equipment for use on oil storage tanks.

* * *

City council of Joplin, Mo., has authorized vacation of a block of Jasper street between Division and Railroad avenues at the request of the Rogers Iron Works Co. to permit that company to enlarge its plant.

* * *

A $10,000 brick and steel addition, 30 x 30 x 30 feet, to the Chevrolet Gray Iron Foundry service plant, Saginaw, Mich., has been started. The new plant will be equipped to handle briquetting of cast iron borings for remelting.

* * *

A. P. Green Fire Brick Co., has appointed Bradshaw & Co., 530 Fourth avenue, Pittsburgh, a representative for its refractory products.

USE MAEHLER equipment and eliminate the "guesswork" in your core baking — forget the problem of compromising between under-baked and over-baked cores. Every core, large and small, thin or heavy, can be perfectly baked at the same time — the Maehler way! And the baking time is often reduced from 40% to 60%. That means more loads per day of better cores. Maehler equipment has proved time and again that the better fuels can be burned resulting in ***less overall baking costs.*** Temperatures are automatically controlled, and maintained within 10°F.

Why not ask for all the details — you will find it profitable.

A Maehler Engineer will help you select proper equipment for your problem — or show you how your present ovens can be improved with a Maehler Air-Heat System. Write for details today.

THE PAUL MAEHLER COMPANY, 2200 W. Lake St., Chicago, Ill.

Book Review

The Open Hearth Furnace, by William C. Buell Jr., cloth, 308 pages, 6 x 9 inches, published by the Penton Publishing Co., Cleveland, and supplied by THE FOUNDRY, Cleveland, for $4.00.

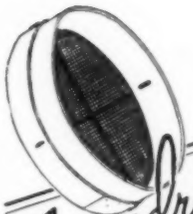
This book, which is volume III of a triology on the open-hearth furnace, comprises a comparison of the ancillary systems of selected existing open hearth furnaces, and the development of basic design principles. It discusses checker work and recuperative and regenerative effects therein, and describes flues, valves and waste heat boilers.

The book is divided into 18 chapters comprising an introduction, a discussion of fluid flow in ancillary systems, a description of typical slag pockets, and data on design of open hearth slag pockets. Chapters V, VI, VII, and VIII relate to typical fantails, design of open hearth fantails, typical regenerator chambers, and connecting flues. Design of open hearth regenerator chambers, distribution and flow of fluids in regenerator chambers, checker work for open hearth furnaces and heat exchange in regenerators are the topics of the next four chapters. Subjects of the remaining chapters are, flues for open hearth furnaces, valves for open hearth furnaces, waste heat boilers, open hearth furnace control, flow diagrams, and conclusion.

CHRISTMAS SEALS

Help to Protect Your Home from Tuberculosis

The twenty-ninth annual national safety congress and exhibition will be held in Chicago, Oct. 7 to 11, 1940, with headquarters at the Stevens hotel.



Foundry RIDDLES

HERE is a foundry riddle that will stand the "gaff" because it has been constructed and designed especially for foundry use. "Buffalo" riddles are noted for long life and the ability to do faster, cleaner work. It will pay you to try Buffalo's the next time you buy riddles.

Available in three stock sizes: 16", 18" and 20" diameter with mesh of either steel, galvanized, tinned or brass wire cloth, supported by two, three or four wires as specified. Ask Us For New Folder No. 91-B

"We are not connected with any other wire weaving company in New York State or any other part of the United States."

Buffalo WIRE WORKS Co., Inc.
425 TERRACE, BUFFALO, NEW YORK
Branch Office & Warehouse: 11 South 7th St. Philadelphia, Pa.

Buckeye Silica Firestone

Sawed or Split

---a natural rock for LINING---

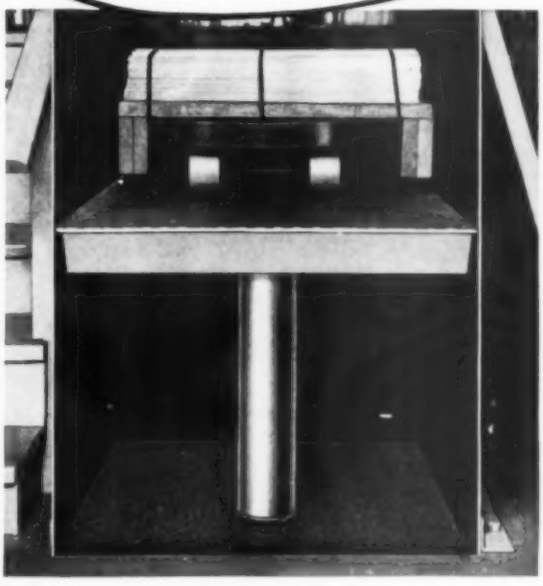
Soaking Pits . . . Blast Furnace Ladles
Bessemer Converters . . . Mixers
Grey Iron Cupolas
Foundry Crane Ladles
Air Furnaces . . . Drop Forge Bottoms
Acid Pickling Tanks

LASTS LONGER COSTS LESS

Write for Literature

The Cleveland Quarries Co.
1125 Builders Exchange Building
Cleveland, Ohio

Reduce HANDLING COSTS with CURTIS Hydraulic Cylinders



Almost every plant has one or more lifting operations that can be done more quickly, more accurately and at *less cost* with Curtis Hydraulic Cylinders. It is the modern, efficient method of material handling that is saving work and money everywhere.

The first cost of Curtis Hydraulic Cylinders is low. They are inexpensive to operate and maintenance is negligible. They soon return the original investment in savings, and continue to give dependable, low-cost service for many years.

Control in raising and lowering is simple and accurate—safely oil-locked at all heights. Use regular shop air lines (or electric oil pump). Capacities up to 16 tons.

Send coupon below for free booklet suggesting applications in your industry.

CURTIS Compressors • Air & Hydraulic Cylinders
Air Hoists • I-Beam Cranes & Trolleys

CURTIS PNEUMATIC MACHINERY COMPANY
1922 Kienlen Avenue, St. Louis, Missouri
Gentlemen: Please send data on Curtis Hydraulic Cylinders, and your 28-page booklet, "How Air is Being Used in Your Industry."

Name _____
Firm _____
Street _____ State _____
City _____

WHY

did one of the largest steel corporations* put in Walker-York furnaces for nonferrous melting? They were not limited in their choice.

*Name on request.

CRUCIBLE FURNACE CO.

CHARLOTTESVILLE, VA.

THE NEW No. 0

CORE BLOWER

No. 0 Core Blowing Machine

designed for small core work, such as brass plumbing goods and small fittings.

Fast—easy to use—economical in first cost and repairs.

Write for Specifications and Price

CORE BLOWERS FOR ALL REQUIREMENTS

WM. DEMMLER & BROS.
KEWANEE, ILLINOIS

YOU'D SMILE, TOO-- if your cores were pasted with "STIKTITE"--our strong, fast drying core paste. It stands up under high temperatures, and does not swell in the joints. Can be used as a core binder too. I'll send you a sample if you'll say the word.

Bill Gagger

We Manufacture

Seacoals, 10 different grinds.
Core Compounds, Plumbagos, Blackings, Core Washes - - in grades for every purpose.
Parting Compounds: Tripoli, Non-Silica, Liquid.
Core Paste, Paste Binder, Dust On Facing, Special Facings and Compounds to fit any job.

We Distribute
Glutrin Goulac Purite
"Volclay" Wyoming Bentonite
Soapstones Silica Flour

LEADERS FOR 60 YEARS..

The Smith Facing & Supply Co.
1857 Carter Rd., Cleveland, Ohio

RADIANT FACINGS Since 1879

The Ideal Material for Sand Blasting

. . . . . it cleans fast
. . . . . *at reduced cost*

FLINT SHOT gives a class of finish impossible to duplicate with any other forms of abrasives. Its round, pearlike granules are as hard and sharp as flint. Does not split up, only wears down and can be used over and over again many times. It flows freely, requiring less air power. FLINT SHOT LASTS. Relatively dustless.

Try FLINT SHOT and you'll be convinced.

Engineering Service Gratis.

Three plants to meet your needs with dispatch.

Washed, Dried and Screened Special Sands for
Steel Moulding
Furnace Bottoms
Cores, Openers
And Silica Flour

OTTAWA SILICA COMPANY

Ottawa, Illinois

THE BEST KNOWN NAME IN IRON

HANNA

HANNA has been casting pig iron in sizes to suit melters' requirements for 72 years.

HANNA PIG IRON

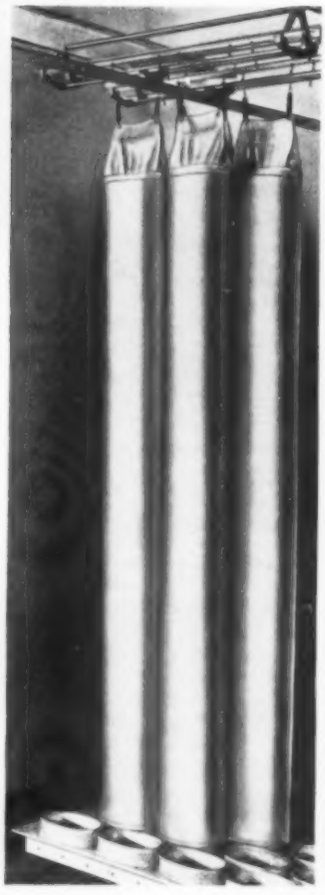
NATIONAL STEEL

THE HANNA FURNACE CORPORATION
MERCHANT PIG IRON DIVISION
OF NATIONAL STEEL CORPORATION

Buffalo Detroit New York Philadelphia Boston

PARSONS *for Leadership in* DUST CONTROL

The Oval Bag Dust Arrestor will "clear the air" for you with continuous high efficiency — WILL NOT PLUG even when used with the most difficult shakeouts. *Write for bulletin.*



PARSONS ENGINEERING CORPORATION
CLEVELAND OHIO

Specialists in
PATTERN LUMBER

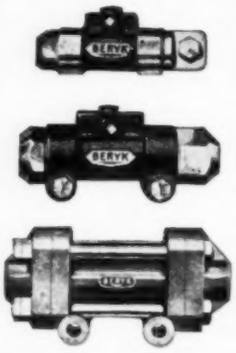
We supply pattern lumber from coast to coast

•

Carload, part car and immediate delivery from Cleveland Stock

DOUGHERTY LUMBER CO.
CLEVELAND, OHIO

How are you fixed for
VIBRATORS?



● We can supply you with a size and type of vibrator to fit any type of molding machine and pattern plate. Not a bad idea to replace old vibrators now and stock up with a few spares to meet emergency needs. Why not let us supply you with BERYK's . . . an important item of foundry equipment which we've specialized in for over 25 years? For immediate shipment, write or wire your order to—

THE BERYK COMPANY
1266 WEST 2nd ST., CLEVELAND, O.

Produce Better Alloys
Faster and Cheaper With

HAUSFELD
Gas and Oil Fired
MELTING FURNACES

Write for Complete Catalog of Single Burner and Multiple Burner, Tilting and Stationary Crucible and Non-Crucible Furnaces.

THE CAMPBELL-HAUSFELD CO.
300-320 Moore Street **Harrison, Ohio**

CHECK YOUR EXHAUST SYSTEMS
WITH THE
"ALNOR" VELOMETER

This all-purpose air velocity meter indicates air velocities directly and instantaneously on the scale in f.p.m. without the necessity of timing or mathematical calculations. Standard range 0-300, 0-3000 f.p.m. Other ranges available up to 18,000 f.p.m.

Write us today for a folder giving more complete information.

ILLINOIS TESTING LABORATORIES, INC.
418 N. LaSalle Street **Chicago, Illinois**

THE
JACKSON IRON & STEEL COMPANY
Manufacturers of
"JISCO"
SILVERY
PIG IRON SPECIALTIES
•
JACKSON, OHIO

GIFFELS & VALLET, INC.
FOUNDRY ENGINEERS

SURVEYS

Operating Cost Studies — Investigations—Reports — Suggestions & Recommendations for Modernization & Labor Saving Equipment.

LAYOUTS AND DESIGNS

Buildings & Equipment — Material Handling — Labor Saving Devices — Dust & Smoke Collection — Specifications — Estimates — Complete Engineering Service By Large & Experienced Staff.

1000 MARQUETTE BLDG. **DETROIT, MICH.**

NATIONAL
SILICA
FIRESTONE

The Ideal Material for Lining
CUPOLAS — CRANE LADLES — AIR FURNACES

Send Us Your Inquiries

NATIONAL STONE CO.
DEPT. F, ELLWOOD CITY, PA.
Phone Beaver Falls 61

COMB'S GYRATORY RIDDLES

Greatly Reduce Riddling Costs Through Speed and Labor Saving

Available in four types and sizes, Comb's Gyratory Riddles are noted for their low maintenance cost (½c to 1c per hour) and their enormous capacity.

• • •

30 DAYS FREE TRIAL

Write for descriptive catalogue; choose the type best suited to your needs and use it for 30 days. We pay the freight both ways if you decide to return it!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas

UNAPPROACHED AIR VALVE PERFORMANCE

Leak-proof—Saves air. Accurate control. Easy to use. No packing glands. No external buttons or levers. All working parts enclosed. Amazingly simple construction. Low maintenance. Exclusive features made possible by patented enclosed actuating lever attached to valve by ball and socket joint. Thousands used in most modern plants.

Patented May, 1939

Try the Air-O-Chek

Get acquainted with the Air Valve that's different. Order sample on approval.

Air-Way Pump & Equipment Co.
405 S. Jefferson St. Chicago, Ill.

For Snagging and Cutting-Off

MANHATTAN ABRASIVE WHEELS

Grind accurately at low cost with these even-wearing, high production wheels, engineered for the job by an experienced staff of specialists. Consult our

ABRASIVE WHEEL DEPARTMENT

THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.
Executive Offices and Factories, 77 Townsend Street, Passaic, N. J.

Send FOR OUR NEW CATALOG

Listing sizes and applications of the company's pattern letters and figures, this new catalog, just off the press, presents also steel letters and figures; wood and leather fillet; brass letters for cement work; and branding irons. Send for your copy today. Your supply house will gladly take care of your requirements for these products. They are manufactured by a company that has been in business for over 75 successful years.

H. W. KNIGHT & SON INC., Seneca Falls, N. Y.

For Blowing Cores
INSERT

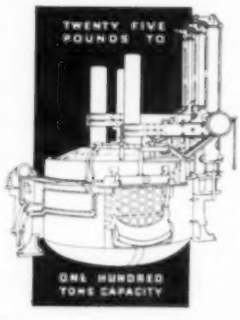
SMILLIE VENTS
IN YOUR CORE BOXES

for
- Greater Vent Area
- No loss of sand
- No Saggy Cores
- Longer Life
- Machinable for Contours
- Sturdy Construction

Sizes from 1/16" to 1" in 1/16" steps.

Samples and prices upon request

C. M. SMILLIE & CO.
520 E. Larned St. Detroit, Mich.



Moore Rapid
Lectromelt *Furnaces*

Door charge and top charge types of furnaces for rapid and economic production of gray and malleable irons and carbon and alloy steels.

PITTSBURGH LECTROMELT FURNACE CORP.
PITTSBURGH, PA.

PYRO THE SIMPLIFIED OPTICAL PYROMETER

Will pay for itself!

Because it absolutely eliminates guess-work, waste and spoilage.

■ PYRO is simple to use, rugged in construction (3 lbs.), easy to maintain and adjust, absolutely precise and dependable. Practically no upkeep cost. Developed especially for foundry use. Foundries swear by it!

■ Write for BULLETIN 80 for details. For Non-Ferrous Foundry use PYRO IMMERSION Pyrometer. Ask for special catalogue.

The PYROMETER INSTRUMENT Co.
106 Lafayette Street New York, N. Y.

Classified Ads

Help Wanted

WANTED

Thoroughly competent man to take charge of Foundry Conveyor Operation, light and medium work. Must have ability to get out full production. Address Box 783, THE FOUNDRY, Cleveland.

FOUNDRY EXPERT

needed by plant in Hong Kong. Experienced in gray iron and light metal foundry work, particularly in connection with automotive engines. Preferably started from the bottom of a foundry and advanced to the position of foreman or superintendent. Please state experience, education, salary desired, age, nationality. Address Box 769, THE FOUNDRY, Cleveland.

ASSISTANT MOLDING FOREMAN WANTED

Experienced in modern methods of machine and bench production of high quality small steel castings. Address Box 771, THE FOUNDRY, Cleveland.

WANTED

Steel foundry with 1500 tons monthly capacity of electric and open-hearth castings has two opportunities for men between 24 and 35 years of age. One is for a molding foreman and the other for a core-room foreman. Address Box 787, THE FOUNDRY, Cleveland.

REPRESENTATIVES WANTED

to sell rapidly growing line of foundry supplies on commission basis. Full or part time. Territories open in United States and Canada. Address Box 789, THE FOUNDRY, Cleveland.

CHILL ROLL-MAKER

with both molding and metal-making experience. Reply must give full details. Address Box 763, THE FOUNDRY, Cleveland.

SALESMEN

Acquainted with gray iron and nonferrous foundry trade. To talk to gray iron foundrymen and introduce a superior patented material which meets their needs. U. S. and Canada territories open. Auto needed. Write for details and assignment; give brief history of experience and qualifications. Address Box 788, THE FOUNDRY, Cleveland.

STEEL FOUNDRY MOLDING FOREMAN

Must have at least 10 years electric foundry practice—understand costs and a good record on production with small losses. Address Box 772, THE FOUNDRY, Cleveland.

MOLDER

Wanted for service in South America. Unmarried molder experienced in molding bronze, cast iron and steel into large and small castings; and capable of operating coke fired cupola, small bronze gas fired melting furnace and 500 lb. electric furnace. Wages $250.00 per month plus board, quarters, medical attention and transportation. Communicate with **D. E. Mitchell, Post Office Box 1196, Pittsburgh, Pennsylvania.**

CLEANING DEPARTMENT HEAD

for electric foundry making heavy section and pressure steel castings, man who has come up from the bottom and can get results, not afraid of work. Light casting man not wanted. Give references. Address Box 765, THE FOUNDRY, Cleveland.

MALLEABLE FOUNDRY SHOP PRACTICE ENGINEER

State references and foundry experience. Address Box 767, THE FOUNDRY, Cleveland.

MELTER—ELECTRIC FURNACE

One who knows low content alloy steels and latest melting practice. Give full references and record. Address Box 766, THE FOUNDRY, Cleveland.

Employment Service

SALARIED POSITIONS—FOREMEN—MANAGERS—SUPERINTENDENTS

Our system of searching out higher-bracket salaried positions, hiding your identity, increases your salary commensurate with training and experience. For valuable information write **Foundry Department, EXECUTIVE'S PROMOTION SERVICE, 300 B Street S. E., Washington, D. C.**

ATTENTION FOUNDRY OWNERS

Write or wire us for technically-trained practical foundry foremen, superintendents, production managers, chemists, metallurgists, core foremen, cost clerks, salesmen, patternmakers, melters (electric, open-hearth, converter and cupola). No charge. **McLAIN'S SYSTEM, INC., 804 Goldsmith Bldg., Milwaukee, Wis.**

SALARIED POSITIONS
$2,500 to $25,000

This thoroughly organized advertising service of 29 years recognized standing and reputation, carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details.

R. W. BIXBY, INC.
101 Delward Bldg., Buffalo, N. Y.

Positions Wanted

MANAGER

With practical experience of value to a modern production foundry and machine shop. Willing, cooperative, experienced. Extensive sales contacts in central states. Mechanical engineer and metallurgist. Twelve years in present connection. Substantial references. **P. O. Box 406, Oshkosh, Wisconsin.**

GENERAL MANAGER—SALES EXECUTIVE

with valuable experience in managing, building up and maintaining foundry and machinery business on profitable basis invites correspondence preliminary to interview. Ability to direct all office, sales, financial and production activities efficiently and economically unquestionably established by previous record. Address Box 485, THE FOUNDRY, Cleveland.

ACID ELECTRIC STEEL MELTER

Ten years experience in carbon and alloy steels. Thoroughly experienced with any physical and chemical specifications. Am familiar with molding light steel castings and am capable of handling men. Address Box 790, THE FOUNDRY, Cleveland.

FOUNDRY SUPERINTENDENT

Twenty years in foundry supervisory capacities. Gray iron, semi-steel, nickel alloy, high-test iron, light, medium and heavy. McLain System cupola practice. Know foundry costs and estimating. Experience includes high-grade machine tool castings, gas engines and compressors, general jobbing and production work. Exceptional ability handling labor. Good personality. Fine references. Address Box 665, THE FOUNDRY, Cleveland.

CONTACT MAN

Available to company dealing in coal, coke, pig iron, silvery, sand or fire brick. Sixteen years experience in iron and steel industry. Technical education. Age 38, married. At present employed. Address Box 741, THE FOUNDRY, Cleveland.

METALLURGICAL ENGINEER

Active and energetic with seventeen years successful record, solicits confidential correspondence. Trained in the manufacture and development of pressure castings, valves, rolls, and stainless steel specialties, where both technical and executive knowledge are essential. Bachelor, and Masters Degree from prominent universities. Address Box 781, THE FOUNDRY, Cleveland.

DEPARTMENT HEAD

Want foundry connection as department head, or as foreman, superintendent, or manager of gray iron foundry. Employed now, same place past five years. Steady, sober, and dependable, with good reputation. Address Box 726, THE FOUNDRY, Cleveland.

BRASS FOUNDRY SUPERINTENDENT

TECHNICALLY TRAINED AND PRACTICAL EXECUTIVE. SPECIALIZE IN PRESSURE CASTINGS. KNOW ALL MIXES MELTING EQUIPMENT. CLOSE SUPERVISION GIVEN ALL DETAILS OF FOUNDRY. ADDRESS BOX 779, THE FOUNDRY, CLEVELAND.

CASTING SALESMAN

wants connection with foundry making light gray iron production castings for Chicago district representation. Commission basis. Address Box 775, THE FOUNDRY, Cleveland.

ELECTRIC FURNACE MELTER

Acid practice, six years experience on alloy and carbon steels. At present employed. Married. Address Box 791, THE FOUNDRY, Cleveland.

METALLURGIST

Experienced in technical control and supervision of foundry operations on gray iron, malleable and alloy iron, physical and chemical laboratories. Responsible for quality and economical production of specified castings. Address Box 758, THE FOUNDRY, Cleveland.

STEEL FOUNDRY MANAGER OR SUPERINTENDENT

Twenty-nine years experience open-hearth, electric, converter, carbon, manganese, alloy, heat, acid resisting steels. Mechanical metallurgical engineer. Practical, technical training; practical molder. Expert in efficiency, production, sand control, rigging of molding machines. Maximum production at lowest cost. My system of heading and gating will increase the yield at least twenty per cent. Will put your foundry on excellent paying basis. Address Box 718, THE FOUNDRY, Cleveland.

PERMANENT MOLD ENGINEER

17 years experience. Wish to make connection with progressive concern now in or contemplating permanent mold field. Expert on cost, estimating, production, tool room, engineering, metallurgy, smelting practice, research and development. Address Box 768, THE FOUNDRY, Cleveland.

FOUNDRY MANAGER

Well qualified in operating, sales and business administration through years of experience in ferrous and nonferrous foundries, in the jobbing field. Trained in fundamentals in Business school and Engineering College. Adequate references. Address Box 782, THE FOUNDRY, Cleveland.

METALLURGIST AND MANAGER

20 years experience as manager of gray iron, steel and nonferrous metal foundries, in conjunction with research laboratories, seeks responsible position. Single. Available immediately. Address Box 780, THE FOUNDRY, Cleveland.

FOUNDRY EXECUTIVE

Twenty-five years experience from laboratory to Manager. Qualified to handle budgetary and production control, layout of plant and equipment, cost reduction, cupola-operation and other foundry problems. Address Box 774, THE FOUNDRY, Cleveland.

METALLURGIST-CHEMIST

Experienced in gray iron, malleable and steel foundry work, including technical control and supervision of foundry operations, physical and chemical laboratories. Address Box 732, THE FOUNDRY, Cleveland.

GENERAL FOUNDRY FOREMAN

15 years foreman, heavy or light jobbing, machine and tool castings; cupola practice. Well up in foundry practice, good handler of skilled and unskilled men. New Jersey preferred. Best of references. Address Box 786, THE FOUNDRY, Cleveland.

GRAY IRON SUPERINTENDENT

Experienced on Agricultural, Furnace and Boiler, General Jobbing, Glass House, and Sanitary work. Well-versed in all branches of foundry and core room work. Familiar with all makes of machines, can rig for maximum production. Good metallurgist, and good handler of labor. Excellent references. Address Box 704, THE FOUNDRY, Cleveland.

FOUNDRY FOREMAN

Broad gray iron jobbing experience, especially machinery and marine. Well versed green and dry sand molding. Can make own iron. Also moderate knowledge brass and aluminum. Opportunity to prove ability wanted. Go anywhere. Address Box 773, THE FOUNDRY, Cleveland.

ASSISTANT SUPERINTENDENT

Young man with experience as Assistant Superintendent in jobbing and production shop of nation-wide foundry company. Holds Mechanical Engineering Degree of accredited university. Experienced in production of gray, wear-resistant and high-test cast irons. Also sand control, modern technique of gating, risering, and cupola melting. Has practical experience in time and motion study. Address Box 762, THE FOUNDRY, Cleveland.

BRASS FOUNDRY FOREMAN

on plumbing, castings, jobbing, or specialty work. Sober and steady. Address Box 785, THE FOUNDRY, Cleveland.

MELTER

Electric Steel. Practical man with plenty of experience. Take complete charge of melting and pouring. References. Address Box 784, THE FOUNDRY, Cleveland.

NONFERROUS FOREMAN

High pressure valves, miscellaneous brass, bronze, nickel silver, bearing, plumbing, chandelier castings, and aluminum. Jobbing and production. Would appreciate position with plant manufacturing any of these products. **John J. Barta, 1710 So. Loomis St., Chicago, Illinois.**

GRAY IRON SUPERINTENDENT

Desire connection jobbing foundry, light-medium, 10-20 tons daily, Middle West or East. Experienced patternwork, inspection, foundry operation, machinery and railroad work. Expert knowledge gates, risers, sweep work, weight figuring, rigging. Age 36, married. Address Box 792, THE FOUNDRY, Cleveland.

FOUNDRY FOREMAN

Experienced in ship work, diesel engines, steam engines, and general jobbing work of all kinds. Good rigger, hand or machine molding, good metal mixer, using all scraps to get good clean, strong castings. Any analysis; open shop. Address Box 764, THE FOUNDRY, Cleveland.

Wanted-To-Buy

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, THE FOUNDRY, Cleveland.

Opportunities

MANUFACTURERS' ATTENTION

Very large old established London highly rated firm, branches throughout England. Close government and industrial contacts, seeks to represent on commission basis various American factories. Will pay cash C.I.F. American Sea Port. Especially need, paper, pulp, textiles, uniform cloth, scrap iron, steel, castings, diesel marine engines, aeroplane parts, caterpillar tractor parts, shipbuilding, glycerine, chemicals, explosives. If you want AAA1 selling agency to secure export orders, write for details; explain what items you can offer for export. **Address, P. O. Box No. 3, Birmingham, Alabama.**

GRAY IRON FOUNDRY FOR RENT

Whiting No. 3½ Cupola gas fired coke ovens—5 ton overhead electric crane—experienced local help available—R. R. side track—modern buildings—60 miles from Milwaukee—Ready to start. Machine shop adjacent. Address Box 770, THE FOUNDRY, Cleveland.

FOUNDRY FOR SALE

GENERAL FOUNDRY LOCATED IN GARDNER, MASS., ON MAIN STREET AND MAIN LINE OF B. & M. R. R. WITH SIDE TRACK. PARTIALLY EQUIPPED. BUILDINGS ARE IN FAIR CONDITION WITH SPRINKLERS THROUGHOUT. PLOT AREA APPROXIMATELY 35,000 SQUARE FEET.

GARDNER TRUST COMPANY
GARDNER, MASS.

FOR SALE

Small brass, aluminum and iron foundry and machine shop in large city in West, doing jobbing and marine work, plenty work. Property $4000. Contents at invoice. Must be cash. Owner in ill health. Address Box 777, THE FOUNDRY, Cleveland.

FOR SALE

Large well-equipped foundry in splendid condition, ready to operate, located Indianapolis, Indiana. **Address Owner Frank M. Dell, Indianapolis, Indiana.**

For Sale

FLASKS—MACHINES—FURNACES

BOUGHT & SOLD
SMALL TOOLS

NATIONAL FOUNDRY EQUIPMENT EXCHANGE

35 Charles St. Cambridge, Mass.

REBUILT USED EQUIPMENT

Foundry Supplies
All Sizes used steel flasks.
Haynes Foundry Equipment Company,
326 Eleanor St., Kalamazoo, Mich.

FOR SALE

10—Air Squeezers.

C. & G. FOUNDRY & PATTERN WORKS
2440 Yandes Street
Indianapolis, Indiana

FOR SALE

2—5 ton Toledo Foundry Cranes—45 ft. span AC current. $1350 each.
1—2 ton Shepard Electric Hoist with trolley. AC current, reconditioned.—$300.
James P. Armel, Fulton Bldg., Pittsburgh

BUILDINGS & OVERHEAD CRANES

Prompt Delivery

64' x 182' with 5 ton Crane, D. C.
65' x 275' with 10 ton crane.
64' x 340' with 30 ton Shaw Crane, D. C.
40' x 240' without crane.
Also various O. H. Traveling Cranes & Bldgs.

MACHINERY

3 ton Heroult Electric Melting Furnace, 3/60/2200.
2 Beardsley & Piper Portable Type "T" Sandslingers.
2 ton Whiting Bessemer Converters.

IRON & STEEL PRODUCTS, Inc.
13444 So. Brainard Ave., Chicago, Ill.
"Anything containing IRON or STEEL"

FOR SALE

U. S. Molding Machine—U. S. Model-JS pneumatic jolt squeezer serial No. 1262.
Osborne Molding Machine—No. 405 jolt roll-over pattern draw molding machine, serial No. 5791 D.
Grimes Molding Machine—jolt squeeze molding machine No. 329.
Johnston & Jennings jolt machine table 24" x 26".
International Molding Machine Co. Size 24" x 10" Type R hand turn-over draw machine.
Standard Sand & Machine Co. sand mixing machine (in reserve) Serial No. 16529 size OA.
Oster Pipe Cutter—Cat. No. 652B power pipe cut-off machine serial No. 09.
W. W. Sly Cinder Mill—No.7—24 x 30" brass cinder mill, spur geared with pump and 36" x 9' x 30" 2½" wood tank.
Root No. 3½ rotary pressure blower.
Tilting head type metal cutting band saw.
Grob Bros. type S-14—14" motor driven band saw.
Steel Dump bucket—holds 500 lbs. coke.

WELLMAN BRONZE & ALUMINUM CO.
6017 Superior Avenue
Cleveland, O.

FOR SALE

1—403W Osborne Rollover, Jolt squeezer, pattern draw molding machine 14" draw, 8" jolt cylinder maximum flask 52 x 36 x 17" high.
5—No. 11 Arcade modern molding machines. Pattern table 34" long 7" draw, head to table 18½", 6" squeeze cylinder.
1—No. 22 Arcade modern molding machine. Pattern table 38" long 8" draw, head to table 21", 7" squeeze cylinder.
2—No. 1 Arcade modern molding machines. Pattern table 34" long 6" draw, head to table 17". Hand squeeze and draw.
Address Box 776, THE FOUNDRY, Cleveland.

FOR SALE

Two 350 lb. capacity Detroit Electric Rocking Furnaces complete with control panels, meters, transformers, remote control oil circuit breakers and supply of electrodes. Used approximately one year. Good condition. Address Box 747, THE FOUNDRY, Cleveland.

GOOD REBUILT EQUIPMENT

"SPECIAL" (3)—Coleman No. 2 Junior Core Ovens, insulated steel panel housings, with oil burners, each with (5) drawers, 30" x 42" heights 6"—7"—7"—7"—7".
(3)—Std. & Blystone Sand Mixers.
(2)—30" Tabor hand ram air rollovers.
(2)—30" & 40" Tabor air jarr, rollover, pattern draw.
(12)—½ to 5-ton A.C. & D.C. Electric Hoists.
2-to-50 tons 24' to 100' span A.C. & D.C. cranes.

"WRITE FOR OUR STOCK LIST"

T. B. MacCabe Company
Beury Bldg., Broad & Airdre Sts., Phila., Pa.

FOR SALE

Sacrificing multiple drills, Libby lathes, milling machine, planer, millers, 8" pipe cutter, etc., not required for present production. Highway Trailer Company, Edgerton, Wis.

FOR SALE—SANDCUTTER

One American Foundry Equipment Company 6-ft. type HDXLS3SA, 20 h. p., 3-phase motor 220V, 60 cycle. Used very little. Excellent condition. **MILWAUKEE STEEL FOUNDRY COMPANY, 4?5 SOUTH WATER STREET, MILWAUKEE, WIS.**

FOR SALE

1 Size No. 10 Whiting Cupola.
1 Size 7-B Positive Pressure Blower with Motor and Starter.
1 4 Ton Capacity Shepard Charging Crane 220V, 3P, 60 Cy.
2 14,000-pound Capacity Fairbanks Dial Scales.
1 Electric Winch 14" drum.
1 14 Cu. Ft. Capacity Blystone Sand Mixer.
1 American Sand Cutter 50" Cutting Cylinder width.
1 Production Equipment Sand Cutter Model F 69" Cutting Cylinder Width.
1 Baird Chaplet Machine—Coil Head Type.
1 5000-pound Capacity Fairbanks Dial Scale.
1 Core Crusher 40" drum.
1 Jib Crane—Capacity ¾ ton.
1 LeBlond Metal Lathe, capacity 12".
Address Box 761, THE FOUNDRY, Cleveland.

BIGGER BARGAINS THAN EVER

Furnaces, Cupolas, Blowers, Exhausters, Compressors, Mold Machines, Tumblers, Hoists, Core Machines, Mixers, Motors, Power Equipment, etc. Hundreds in stock. 20 years fair dealing with the foundries. Tell us your needs for better production and money savers.

CLIFTON MACHINERY CO.
1023 W. 6th St.
CINCINNATI, OHIO

FOR SALE

American Foundry Equipment Co. Gravity Type G R sand blast tumbling barrel, size 1, 24" x 36" barrel, gun-type nozzle. Perfect condition. Fischer Casting Co., Plainfield, N. J.

FOR SALE

1—Pangborn Sand Blast Room equipment; Room 24'-0" long x 8'-0" wide x 7'-6" high with No. 7 CC overmounted dust collector, No. 45 Exhauster with 25 HP motor. Return of abrasive—Pneumatic type. Blast tank type AU-11 size 1 with BT separator.

Equipment in excellent condition—can be inspected on site. Will sacrifice for quick sale.

Cleveland Graphite Bronze Co.
880 E. 72nd St.
Cleveland, Ohio

SANDSLINGER FOR SALE

Beardsley & Piper sandslinger, non-reclaiming, motive type, 300 cubic feet capacity, arm swing 16 feet, head speed 2100 R.P.M., in good operating condition. Complete, all motors and starters 3 phase, 60 cycles, 440 volts. Address **Farrel-Birmingham Company, Inc., Ansonia, Conn.**

FOR SALE

Mechanical Woodworker with complete set of tools and cutters at reasonable price. Wadkins & Company, Lanchester, England, make. Very good condition. For sale by **IMPERIAL PATTERN WORKS, 2936 Pillsbury Avenue, Minneapolis, Minnesota.**

REBUILT
BLOWERS—FANS—EXHAUSTERS

Connersville-Roots positive cupola blowers. Centrifugal blowers for gas and oil burning. Sand blast, grinder and dust exhausters. Ventilating fans.

GENERAL BLOWER COMPANY
406 N. Peoria St. Chicago, Illinois

MOLDING MACHINES

2 Osborn No. 403 jolt, roll-over pattern draw, flask cap. 44 x 36"—pattern draw 12" lifting cap. 1400 pounds—jolt cyl. 8" with swing-out Mold Table.
2 International Type "F" 27 x 12" draw jar ramming, power turn-over power draw, 1400 pounds cap. @ 80 pounds pressure (enclosed cyl. type).
1 International Type "F" 26 x 8" draw, 900 lbs. capacity @ 80 lbs. pressure.
1 No. 24 Davenport jolt roll-over draw, 26 x 40" flask cap, 10" draw, 1000 lbs. capacity.
2 No. 22 Davenport, outside flask capacity 22 x 34" pattern draw 10", 750 lbs. cap. @ 80 lbs. press.
1 International Type "A" 26 x 12" draw, power turn-over power draw, 900 lbs. cap. @ 80 lbs. press.
1 Pridmore hand draw, air roll-over electric jolt, 33 x 25" table, with 2 HP 220V AC Motor.
3 No. 832 Milwaukee hand jolt and roll-over, foot draw, 30" height pattern table, 8" draw, 15 x 32" table, max. flask size 24 x 32".

AMERICAN SANDCUTTERS

1 Model "HP" size 56, 48" cutting cyl. 56" between wheels with 2—3-60-220V AC Motors.
1 Model "AA" size 72, 62" cutting cyl. 68" between tractor wheels, complete with 10 HP 220V AC Motor, Cable and Take-Up Reel.
1 Type "K" heavy duty wide cutting type, size 72, 60" cutting cyl. 72" between wheels, Buda Eng.
1 Model F, Type 112-92, 80" cutting blade, 8½ ft. between tractor wheels, equipped with Cleveland Elec. 3-60-440V AC Motors.

MISCELLANEOUS

1 Hisey-Wolf floor stand Grinder, Type 10-WFA, 24 x 4" wheels with 10 HP 440V AC Motor.
1 No. 2, 6 ft. dia., double muller Simpson Mixer, single pulley drive.
1 B & P Type "S" stationary 9 ft. Sandslinger, 7 ft. ramming cap. per minute with 220V AC Motors.
1 Schwartz "D" 42" Furnace on stands, tilting type, cap. in brass 1000 lbs. with oil burners.
1 500 lb. Ingersoll-Rand size "A" Air Hoist, top hook.
1 45" dia. Ohio Lifting Magnet, cap. scrap 1100-1400 lbs.

Our LIST shows COMPLETE STOCK of Foundry and Industrial Equipment BARGAINS.

SCULLY-JONES & COMPANY
19th & Rockwell Sts., Chicago, Ill.

Index to Advertisers

Adams Company, The 79
Air Reduction Sales Co. 74
Air-Way Pump & Equipment Co. 121
Ajax Electric Furnace Corporation Div. of The Ajax Metal Co. 18
Alloy Metal Abrasive Co. 99
American Air Filter Co., Inc. 77
American Bridge Co. 105
American Chain & Cable Co., Inc. 53
American Foundry Equipment Co., The . . . 19
American Foundrymen's Association, The . . 63
American Gum Products Co. 115
American Optical Co. 10
American Steel Abrasives Co., The 113
Arcade Manufacturing Co. 101

Bakelite Corporation 69
Beardsley & Piper Co., The 58, 59
Beryk Co., The 120
Bethlehem Steel Co. 3
Blaw-Knox Div. of Blaw-Knox Co. 103
Brooke, E. & G., Iron Co., The 103
Brosius, Edgar E., Inc. 82
Buffalo Wire Works Co., Inc. 117

Campbell-Hausfeld Co., The 120
Carborundum Co., The 73
Carl-Mayer Corp., The 115
Champion Foundry & Machine Co. 56
Cleveland Chaplet & Mfg. Co. 115
Cleveland Quarries Co., The 117
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co. 114
Climax Molybdenum Co. 45
Columbia Steel Co. 105
Crucible Furnace Co. 118
Curtis Pneumatic Machinery Co. 117

Demmler, Wm., & Bros. 118
Detroit Rocking Electric Furnace Div. of Kuhlman Electric Co. 112
Detroit Testing Machine Co., The 100
Diamond Clamp & Flask Co. 111
Dietert, Harry W., Co. 111
Dougherty Lumber Co. 120

Electro Metallurgical Co. 13

Federal Foundry Supply Co., The 51
Foundry Equipment Co., The 113
Fox Grinders, Inc. 101

Giffels & Vallet, Inc. 120
Globe Iron Co. 71
Great Western Mfg. Co. 120

Hanna Furnace Corp., The 119
Hercules Powder Co., Inc. . . . . [illegible]
Herman Pneumatic Machine Co. . . . . [illegible]
Hydro-Blast Corporation, The 14, 15

Illinois Testing Laboratories, Inc. 120
Ingersoll-Rand Co. 95
International Molding Machine Co. 87
International Nickel Co., Inc., The 39

Jackson Iron & Steel Co., The 120

Knight, H. W., & Son, Inc. 121

Link-Belt Co. . . . . Back Cover

Macklin Company 48
Maehler, Paul, Co., The 116
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc. 121
Mathieson Alkali Works (Inc.) . Inside Front Cover
Milwaukee Chaplet & Mfg. Co. 105
Milwaukee Foundry Equipment Co. 93
Modern Equipment Co. 89

National Engineering Co. 17
National Steel Corp. 119
National Stone Co. 120
Nicholls, Wm. H., Co., Inc. 11
Norton Co. 90

Ohio Ferro-Alloys Corp. . . . . Front Cover
Oliver Machinery Co. 105
Osborn Manufacturing Co., The 47
Ottawa Silica Co. 119

Pangborn Corporation 8, 9, 111
Parsons Engineering Corp. 119
Penola, Inc. 41
Pittsburgh Crushed Steel Co. 101
Pittsburgh Lectromelt Furnace Corp. 121
Pyrometer Instrument Co., The 121

Republic Steel Corp. 20
Robeson Process Co. 115
Roots-Connersville Blower Corp. 115
Royer Foundry & Machine Co. 12

Schneible, Claude B., Co. 85
Scully, Jones & Co. 123
Shepard Niles Crane & Hoist Corp. 106
Simplicity Engineering Co. 104
Sloss-Sheffield Steel & Iron Co. 109
Sly, W. W., Mfg. Co., The 55
Smillie, C. M., & Co. 121
Smith Facing & Supply Co., The 118
Smith, Werner G., Co., The 6, 7
Smooth-On Manufacturing Co. 103
SPO, Inc. 65
Stearns Magnetic Mfg. Co. 102
Steel Shot & Grit Co. 101
Sterling Wheelbarrow Co. 66
Stevens, Frederic B., Inc. . . . Inside Back Cover

Tabor Manufacturing Co. 61
Truscon Steel Co. 110

Union Carbide & Carbon Corp 13
U. S. Steel Corporation and Subsidiaries . . . 105
U. S. Steel Products Co. 105

Whiting Corporation 4
Woodward Iron Co. 81

Table of Contents, Page 5

Classified Advertisers, Page 122, 123